MARCH, 1934

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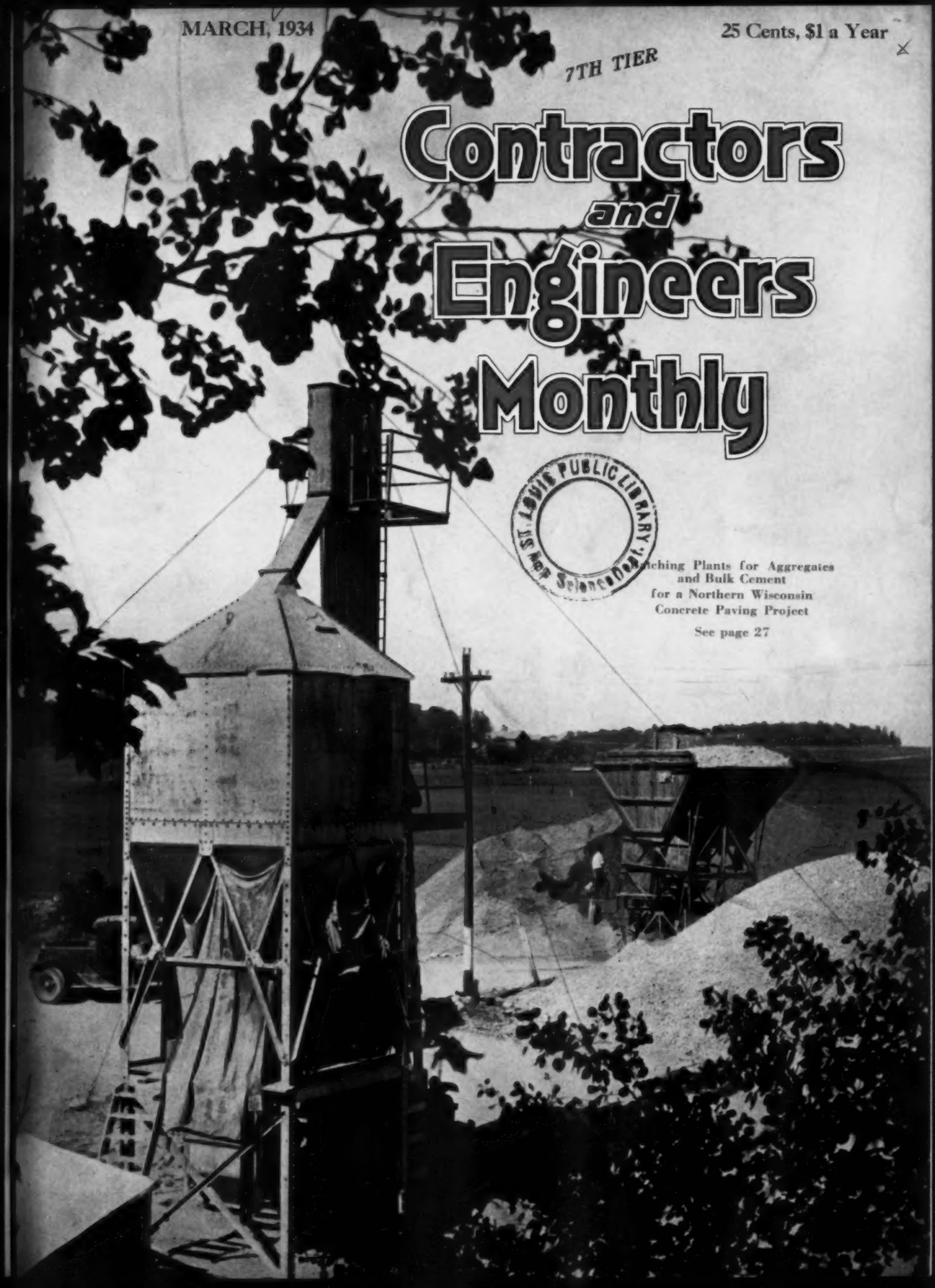
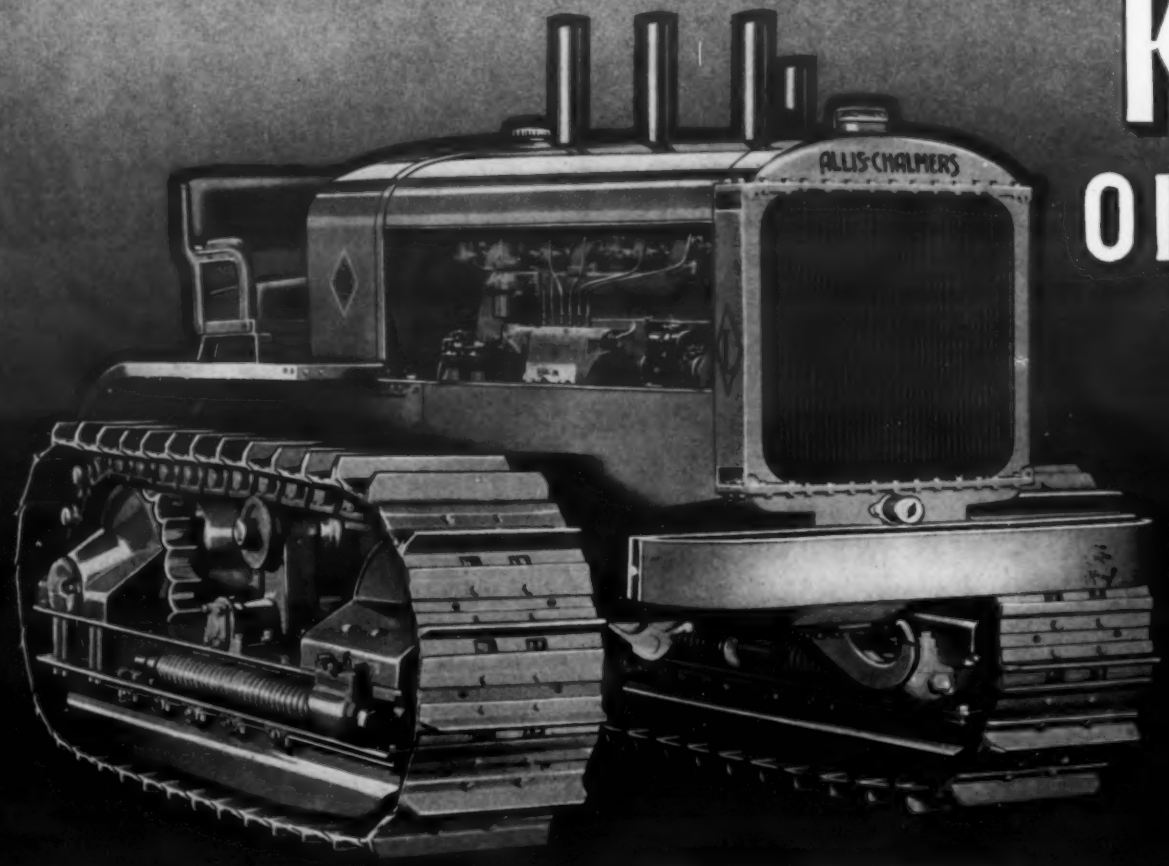
Contractors and Engineers Monthly



Batching Plants for Aggregates and Bulk Cement for a Northern Wisconsin Concrete Paving Project

See page 27

ANNOUNCING the New models "KO" AND "LO" OIL TRACTORS



THE "LO" OIL TRACTOR

THE New Allis-Chalmers Oil Tractors are equipped with a new type of oil engine which operates on Diesel fuel. These engines introduce an entirely new principle in tractor engine design.

We use a Bosch Diesel fuel pump to inject the cold charge with cold air and ignite it with a spark. We do not depend on compression for ignition, but use the time-tried magneto.

The low pressures and orderly burning of the fuel in the A-C oil engines assure a smooth running engine with unexcelled lugging ability and ample power. Fuel consumption is low at all loads.

Two models are now available—the model "KO", developing 48 drawbar horsepower and weighing approximately 11,200 pounds—and the model "LO", developing 76 drawbar horsepower and weighing approximately 23,000 pounds.

Write for further information.

POWER CONTROLLED GRADERS
HAND CONTROLLED GRADERS
SPEED PATROL GRADERS
TRACK-TYPE TRACTORS
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TRACTOR DIVISION—MILWAUKEE, U. S. A.

POWER UNITS .... MODELS 40, 50, 60, 90, H. P.
WHEEL TYPE TRACTORS
TRACK TYPE WAGONS
WAGON TRACKS

A Dual Hot-Mix Plant Set-Up

M. F. Roach & Sons

of

East Bridgewater, Mass.

Used Plants

Near Cape Cod Canal

to Produce

Sand Asphalt for Two Jobs

SAND asphalt, a form of bituminous concrete in which the aggregate is chiefly the sand from gravel deposits in the locality, is the type of paving used entirely on the roads on Cape Cod, Mass., east of the canal. The peninsula is composed of deposits of sand and gravel with a few outcrops of rock, but the gravel deposits predominate. These have been used with great success in creating a major network of highways for the playground of Massachusetts where thousands of motorists each year from all over the country gather to see the quaint and historic scenes and the place where the Pilgrim fathers first set foot on the shores of North America. The chief routes run along the north and south shores of the Cape and were, until a few years ago, 14 and 18-foot sand and asphalt paved ways that were entirely inadequate for the rapidly increasing traffic. With forethought, the State Department of Public Works set to work to widen, resurface and relocate many sections of these highways with the result that now motorists may journey from Boston or New Bedford over wide penetration macadam highways and find equally fine roadways awaiting them on the Cape.

The 1933 program for paving included the straightening of the Bourne-Falmouth highway, cutting off a winding road which ran through a series of settlements, and thereby eliminating several miles of travel that was dangerous because of the too frequent reverse curves. Another section to be paved during the past season was the Hyannis cut-off. Hyannis is the metropolis of Cape Cod and all of the major activities of the south shore of the Cape center there. While the streets are reasonably wide, there is a great deal of congestion caused by parking, so a cut-off was laid out to by-pass the town for traffic which was bound for the end of the Cape, Provincetown. It happened that the contracts for the two jobs mentioned above were awarded to the same organization, M. F. Roach & Sons of East Bridgewater, Mass. A large hot-mix plant was set up about two miles from Bourne, Mass., to furnish the material for the Bourne-Falmouth project and later this plant also supplied the material for a portion of the Hyannis cut-off.

Supplying Aggregate

The aggregate used in the bituminous concrete consisted of pit-run gravel with the oversize stones eliminated, and stone screenings. The gravel pit had about the proper proportions of sand and small gravel in the upper 15 feet but below that the gravel rapidly increased in size to a large proportion of 4 to 6-inch cobbles. The contractor originally had considered installing a small crusher to produce the stone screenings from the oversize cobbles but the borings in the pit showed too small a proportion of stone of crusher size to warrant such an installation. When the stratum of cobbles was reached, the job was running along so well that it was not thought advisable to shut down for the time required to install a crusher.

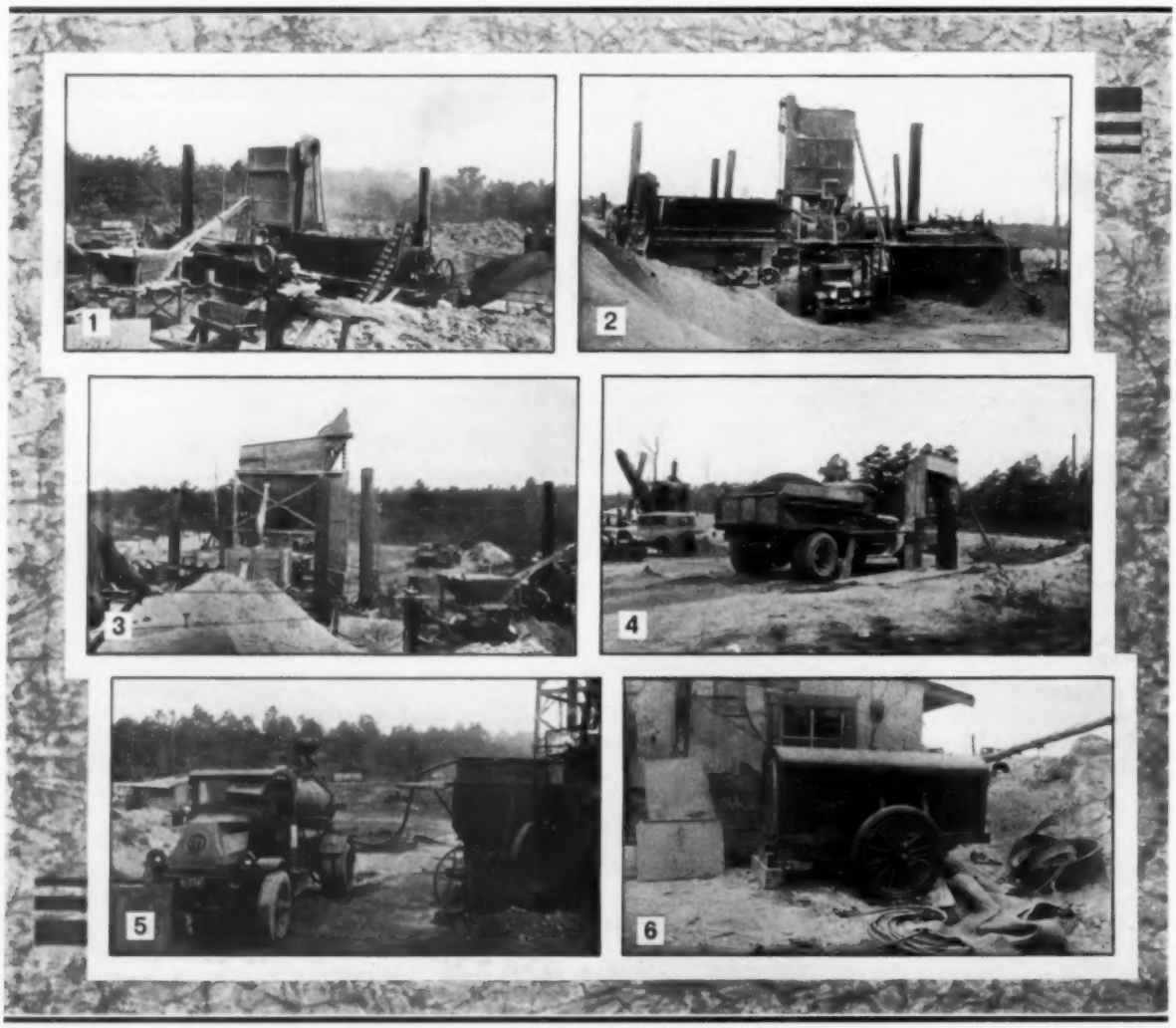
The sand and gravel from the pit was pulled in with a Sauerman 1-yard scraper, using a Lidgerwood hoist powered by a Buda engine. One man operated this unit and delivered the material to a sloping grizzly of 2-inch pipe with 2-inch spacing between the pipes. The oversize was run to the side and hauled periodically to a dump nearby. The material passing through the grizzly dropped into a V-shaped hopper from which one man fed it to the bucket elevator of the Cummer asphalt plant and two men fed it from the opposite side to two other bucket elevators to the driers of the assembled plant.

Stone screenings were purchased from the Blue Stone quarry near New Bedford, Mass., delivered by truck and stocked ahead of the starting of the plant. Later

additional stone screenings were delivered by the Old Colony Stone Co. of Quincy, Mass., by rail to Pocasset, about one mile from the plant, and delivered by truck to the stockpiles at the second bucket elevator of the Cummer plant and above the screenings drier of the assembled plant. One man handled the delivery of the screenings to the bucket elevator and two men shoveled from the stockpile direct to the hopper of the rebuilt drier of the assembled plant. There were two men on the grizzly to remove large stone that stuck in the bars.

OPERATION OF THE ASPHALT MIXING PLANTS

The aggregates as delivered to the driers of the plants consisted of 30 per cent of stone screenings by weight as controlled by the men at the bucket elevator and the hand shovelers. This type of paving has been laid for so long on Cape Cod that there has been developed a large group of men who are expert in all the various processes involved from proportioning the material at the cold elevators to the final raking and rolling of the hot material on the road. H. C. Holden, District Engineer, State Department of Public Works, at Middleboro, Mass., under whose direction the vast network of portland cement, penetration macadam and sand asphalt highways has been laid in southeastern Massachusetts, states that as far as the individual skill of the workers on the road is concerned that portland cement concrete requires the least because of the amount of machinery that can now be used in finishing the concrete. Next is the penetration macadam which does require a certain amount of individual skill in raking the stone after spreading by mechanical means, and in the rolling. But the sand asphalt or bituminous concrete of the Cape requires the greatest development



THE TWO SAND-ASPHALT PLANTS WHICH SUPPLIED THE M. F. ROACH & SONS CAPE COD CONTRACTS IN 1933

1. The 1,250-yard commercial plant with its 3,300-gallon asphalt storage kettle. 2. A side view of the same plant, showing a truck loading. 3. The assembled plant, made of a converted bulk cement handling plant, two driers and a pugmill. 4. Every truck load of hot sand asphalt was weighed by the State Inspector as it left the plant. 5. Making a delivery of asphalt to one of the large asphalt kettles. 6. An ingenious home-made electric lighting plant built as a two-wheel trailer. This unit was built from the wreck of an old Whippet chassis, using the engine, and will furnish current for three 350-watt lights as well as an electric drill.

of the laborer as a skilled artisan to produce the fine smooth surface that is the requirement of the highway department and the aim of every contractor.

The Cummer plant was a 1,250-yard plant equipped with a drier, hot material elevator, screens, separate storage bins for the sand and screenings, weighing buckets for the fine and coarse material and the asphalt, a 3,300-gallon asphalt storage kettle, and pugmill mixer. The asphalt was delivered to the weigh bucket by air pumping. The labor organization required consisted of two men on the platform, one of whom handled the weighing of the two aggregates and the other the weighing of the asphalt and the operation of the mixer and dumping the batches into the trucks below, a fireman for the boiler and engine, and an engineer who had charge of both plants. A foreman had charge of the complete operation of the plants in the production of the hot mix.

The assembled plant produced 1,300-pound batches while the Cummer plant produced 1,000-pound batches, each having 6½ per cent asphalt. The latter plant delivered 14 batches per truck while the larger plant loaded 11 batches. As outlined above, the assembled plant had two driers. These were rebuilt from earlier plants of the contractor and with the other units brought together made an acceptable plant for the production of the necessary material to keep the job going at maximum speed. The two driers delivered their material to a pit from which it was removed by the vertical bucket elevator of a converted Butler bulk cement plant with a screen at the top to separate the material into two sizes. Beneath the bin was a Warren pugmill mixer which handled the 1,300-pound batches which were delivered direct to the trucks as mixed, with no intermediate storage hopper. This plant also had a 3,300-gallon asphalt kettle equipped with a rotary pump submerged in the kettle which by-passed the asphalt when the valve at the weigh bucket was closed.

Asphalt Delivery

The asphalt for the mix was delivered by the Standard Oil Co. of New Jersey through its subsidiary, the Colonial-Beacon Oil Co., in tank trucks f. o. b. the contractor's kettles. The railroad tank cars were switched to a siding at Bourne and the tank trucks hauled the 3 miles to the plant. As the tank cars and trucks were both insulated the asphalt was delivered hot to the kettles. The tank trucks had pumps which handled the asphalt to the kettles as shown in one of the illustrations. The asphalt and batches delivered by the plant were produced at an average temperature of 275 degrees Fahrenheit.

Hauling the Batches

A fleet of 5-ton trucks handled the hauling of the batches. There were six trucks hauling for the Bourne-Falmouth job, and a maximum of ten trucks hauled for one week to the Hyannis cut-off. Barnstable County has a weight limit of 20,000 pounds on its highways and as the total weight of load and truck hauling the asphalt batches was greater than this, a special permit had to be secured allowing 27,000 pounds total.

The steel bodies of the trucks were oiled by swabbing with fuel oil each trip before loading. One day when hauling to the Hyannis cut-off, a distance of about 17 miles, a sudden storm came up and before the plants could be notified there were seven loads of hot asphalt lined up ready to be spread. These were held until the storm had abated about an hour later. The first load, which had been out in all the heaviest rain and which had consequently cooled off more than the others, was dumped to fill a washout and the remainder were used for base where the slight loss of heat would not make so much difference in the rolling. Under ordinary conditions, the loads can be held as long as three hours without damaging the mix through loss of heat. Under these conditions the contractor preferred to use the material for base rather than top where the maximum rolling is required to produce a smooth surface. On this work the base and top course were of the same mix with no difference in the aggregate. The base course was 2½ inches thick compacted and the top 2 inches with an application of 0.1 gallon of cut-back asphalt between the two courses to soften the base and permit a strong bond between the two courses. This is a new method developed a year ago by the state highway department and in the year it has shown its value in preventing cleavage between the two courses. Cores taken of the old and new pavements by means of a concrete coring machine produced homogeneous cores from the new pavements in which the line of demarkation between the two courses could just be traced, while the two courses of the old pavements broke apart. The top of the pavement was sealed with a cut-back asphalt of the same penetration as the asphalt used in the mix, 60 to 70, and then covered with ½-inch keystone and rolled to produce a non-skid surface.

Personnel

The Bourne-Falmouth cut-off job was about 6.5 miles long, and 24 feet wide with widened portions at intersections. The plant was located about 3 miles from Bourne at about the middle of the job. The contract was awarded to M. F. Roach & Sons of East Bridgewater, Mass., and M. F. Roach, Jr., was in charge of the work on this contract. For the State Department of Public Works of Massachusetts, Ernest Hosbach was Resident Engineer.

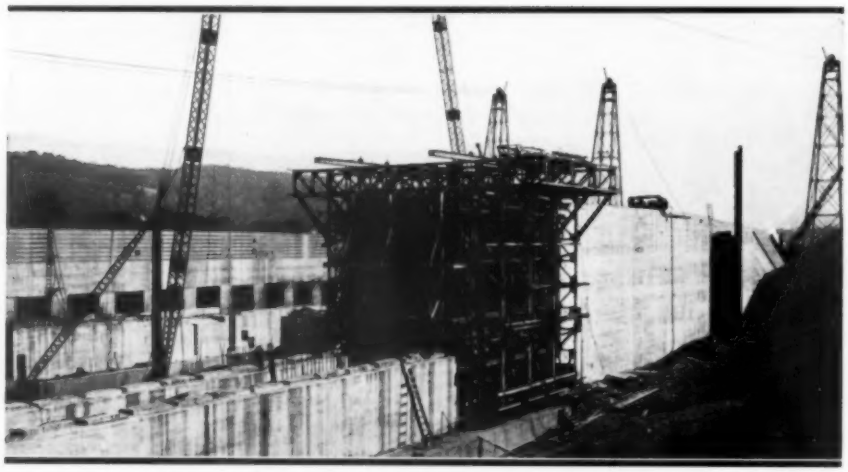
Accident Prevention in Construction

THE Public Works Administration has moved to prevent accidents to workmen employed on projects being constructed by states, counties, cities, towns and private corporations with PWA loans and grants. A copy of the "Manual of Accident Prevention in Construction" will be supplied to the inspector assigned to each non-Federal project to see that construction is in accordance with the plans and specifications submitted to the PWA when application for the allotment was made. These inspectors will require contractors to carry on their work in ways recommended by the Manual.

The Manual was compiled by the Accident Prevention Committee of the Associated General Contractors of America with the assistance of many prominent contractors and consulting engineers, representatives of casualty insurance companies and others engaged in accident prevention work and is a compendium of information on the best methods of organizing work, operating machinery and handling materials in the safest and most efficient manner.

Copies of the Manual were sent out to all state engineer inspectors by Howard A. Gray, Chief of the Division of Inspection of the PWA, for distribution to individual inspectors as they are appointed.

Methods and Machines Used in
Building Montgomery Locks
on the Ohio River near Beaver, Pa.



One of the Steel Form Gantries on the Montgomery Locks Project

A 4,000,000 construction program is now underway in the Pittsburgh Engineer District which has created employment for about 1,000 men in the service of contractors. The largest single project in this program is the building of the new Montgomery Locks and Dam. The latter will not be started until the present construction of the locks is nearing completion sometime this year. The estimated cost of the pair of locks alone is about $2,000,000 and the work is now well along in spite of the floods of March, 1933.

Montgomery Locks are located about 6 miles downstream from Beaver, Pa., on the Ohio River, one of the two major rivers in North America which flow north. The locks are about 30 miles northwest of Pittsburgh, Pa. At the point of construction the river is about 1,750 feet wide and flows with considerable current during times of high water, with rapids at other times. The contract awarded to Booth & Flinn of Pittsburgh was for the construction of the locks and the erection of the gates for the two locks. There are two locks in the project, one 600 feet long by 110 feet wide and the other 360 feet long by 56 feet wide. There are also a land wall, a middle wall and the river wall running parallel with the river and the various sills, guard walls, guide walls and other appurtenances. The major construction involves the building of the three walls first mentioned.

Construction of the Cofferdam and Initial Excavation

Work on the project was started May 28, 1932, with the clearing of the part of the site that was above water and the driving of the cofferdam. About one-tenth of the area now enclosed within the cofferdam was above water at the start of the work. The cofferdam was created by driving Jones & Laughlin steel sheet piles DC-25, of extra strong section adapted to cofferdam deep driving and about 60 feet long. The cofferdam is 450 feet wide and 1,510 feet long inside dimensions. The upper arm or east end is 60 feet wide and 17.5 feet above the pool level. The long arm is 24 to 30 feet wide and the lower end, on which the concrete plant is located, is 80 feet wide. The inside sheeting for the upper and lower arms is steel sheet piling and for the outer or long arm is wood sheeting of 4 x 12-inch fir lumber 26 feet long. The top wales are double 10 x 12's or single 12 x 12's, the middle wales are 14 x 12's single and the lower wales are single 18 x 12's. Cross walls were built every 100 feet at the top of fill to hold the gravel fill against washing in case of flooding. The top

elevation of the sheeting is 680 and the elevation of rock over the entire job runs between 619 and 622. Normal pool elevation is 662.6 and the elevation of the floodgates for the cofferdam is 665. The floodgates, of which there are three, are each 15 feet high and 5 feet wide, equipped with two chain falls for the three gates for raising them to permit filling the cofferdam when it is threatened with flooding from high water. The cofferdam can be filled safely in five hours through the floodgates.

As high water is a great threat to the operation of such a piece of construction as this, the U. S. Engineer Corps in charge of the work for the War Department allow an extension of time for all periods when the coffer is flooded. When the contractor is making every possible effort to unwater the cofferdam, this time is counted toward an extension of the contract time of 730 calendar days from the time of award of the contract. The work is pushed 24 hours a day and 7 days a week with three 8-hour shifts every day.

Excavation and Backfill

The 80 per cent of excavation that was done after unwatering the cofferdam was handled by the cableways and power shovels. The cableways will be described in greater detail later. There were three such cableways extending over the entire project, the head and tail towers being located on the lower and upper arms of the cofferdam.

As the rock was practically level over the entire bed of the river at the location of the locks, most of the excavation was confined to the removal of the overlying sand and gravel. Where rock was excavated it was removed to depths averaging 2 to 10 feet. This was required only where seams of coal endangered the stability of the foundation. The layer of material immediately over the rock was a fire clay of unusual tenacity and the underlying rock in places, while tough enough to require drilling and blasting to permit its removal, rapidly deteriorated upon exposure to the weather and in a few weeks could be broken easily with a slight pressure of the hands.

The shovels used for excavation included one P & H 400 and four P & H 700 machines, all powered with gasoline engines. Of the 80 per cent of the material excavated in the dry about 60 per cent was loaded out with the cableway and shovels to storage at the lower end of the cofferdam for later use as backfill. The excavation was taken out on a 1 to 1¼ slope on either side of all walls with the exception of the land wall where the slope was 2 to 1 on the land side because of the fear of a possible slide of the bank, which would have greatly complicated the work and increased the amount of material to be removed.

A novel method of backfilling which permitted the use of the cableways and also protected the tops of the various walls was devised. Large sheet metal or armor plate A frames were built which were slightly wider than the walls and these were moved by the cableways as desired along the walls. When the skips of material from the storage piles at the lower end of the cofferdam were dumped onto the tops of the frames the material was thus divided to either side, keeping a certain equality in the backfill.

The backfill behind the land wall was handled by small Porter locomotives pulling two or three Western side-dump cars, the number being limited by the grade of the track. At first the material from the storage piles was used for this purpose and the remainder of the land wall backfill was taken from the 80,000 yards of excavation still to be made in the cofferdam between the two lines of sheet piling. The material on the fills was spread by an Allis-Chalmers Model M tractor equipped with an A-C bulldozer.

Such drilling as was required was handled with portable compressors placed in the cofferdam by the cableways. There were three Gardner-Denver portable compressors and one Sullivan which supplied the air for the fourteen Ingersoll-Rand and two Gardner-Denver jack hammers. Deeper drilling than 6 to 8 feet was done by an Ingersoll-Rand wagon drill which handled steel up to 30 feet long on this job.

Cableways

Perhaps the feature of the equipment of the project are the three cableways with spans of 1,510 feet which handle excavation, backfill, sectional forms, equipment, concrete and reinforcing over the entire job, as they are located approximately along the center lines of the three walls. The cables were built to carry a maximum load of 25 tons. Two of the cables are 2¾-inch and the other 2½-inch, each being of Leschen manufacture. The head towers on the lower arm of the cofferdam are 150 feet high and the cables are anchored to deadmen 245 feet back in the stream. The tail towers on the upper arm of the cofferdam are 110 feet high and the cables are anchored 314 feet back. All six anchors are 14-foot Jones & Laughlin circular steel piling with a concrete drum 4 feet in diameter reinforced with 85-pound rails.

Most of the excavation was taken out by loading 5-yard truck-body skips with the shovels and moving them out rapidly with the cableway. Each of the Lidgerwood cableways has a 10 x 12-inch steam hoist. All control of the cableway operation is by light and bell signals located in front of the engineer who can seldom see the operation he is performing, nor can he see the signal man.

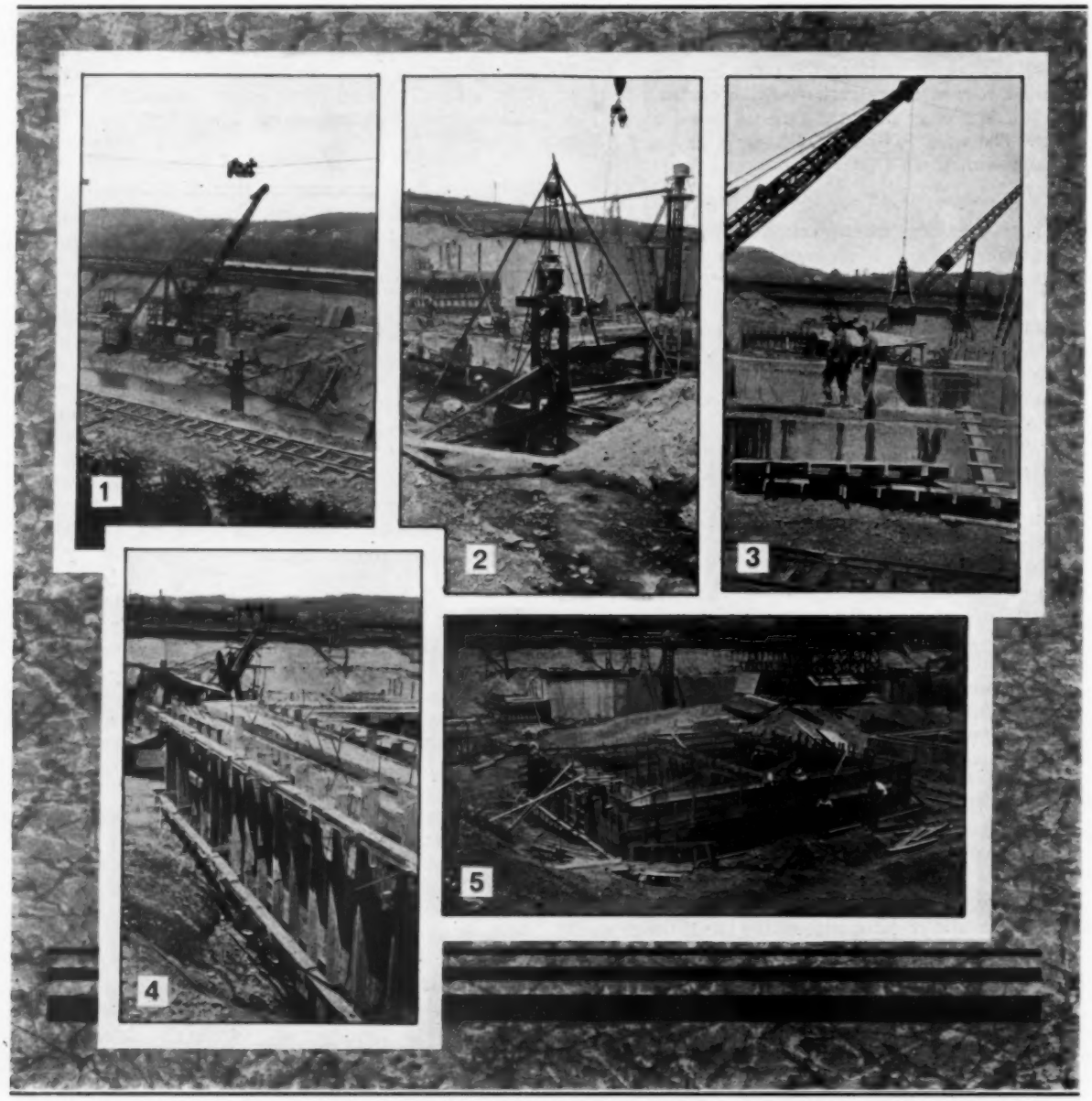
Steel Derricks

Two American-Terry and one Insley stiffleg steel derricks were spotted in the cofferdam so as to divide its area roughly into four equal parts and permit handling of local work expeditiously. These three derricks were installed chiefly because of the time lost through three floods at intervals such that the cofferdam was just about clear of water and mud before the next came along. The derricks saved a great deal of time in the building of twelve caissons at the lower end of the land and middle walls. The upper of the three derricks is a steam unit with a 100-foot boom and was used to pour the upper sills in the 600 x 110-foot lock. The middle derrick which also is steam operated and has a 100-foot boom was used to pour the upper sills for the 360 x 56-foot lock. The lower of the three derricks has an electric 3-drum hoist, a 130-foot boom and was used for the excavation and pouring of the caissons and sill and dam for the 600 x 110-foot lock.

PUMPING EQUIPMENT

Of utmost importance on a job of this kind is the installation of reliable pumping equipment. No cofferdam is 100 per cent watertight and seamy rock such as abounded on this job lets in a great deal of water. It happened that the cofferdam was unusually tight but as soon as drilling began in the rock, many seams were opened up and sizable waterfalls were seen in all parts of the work. As far as possible, the creation of and pumping from local sumps was eliminated but as the work progressed certain parts of the structures cut off the channels that had been created to drain some sections and it was necessary to pump from these local sumps to the main sump.

The pumps which bear the brunt of the pumping from the pit are two 12-inch and one 15-inch Byron-Jackson centrifugals with 100 and 125-hp motors respectively. There is also an American deep-well pump 15 inches in diameter with a 100-hp Westinghouse synchronous motor, a Lawrence Vortex pump 12 inches in diameter with a 100-hp General Electric motor and a 16-inch Allis-Chalmers pump with a 125-hp motor of



DRAINAGE AND CAISSON CONSTRUCTION ON THE BOOTH & FLINN CONTRACT AT MONTGOMERY LOCKS, PA.

1. *Setting one of the vertical centrifugal pumps with the high-line cableway. In the background is seen the Ohio River beyond the steel sheet piling caisson.* 2. *A similar 6-inch vertical pump handily set up with a tripod for local drainage. At the right is seen one of the large pumps for unwatering the cofferdam after a flood.* 3. *Clamming out No. 35 caisson with one of the steel derricks after the wood forms had been stripped from the concrete.* 4. *Wood form details on No. 33 caisson.* 5. *Assembling the wood forms for No. 31 caisson.*

the same make. There are seven Lawrence Vortex 6-inch pumps with 30 and 50-hp motors and eight Domestic double and single diaphragm pumps with gasoline engines.

A 10-inch deep well was driven near the site of the work to supply the necessary domestic water supply and for mixer water. This is equipped with an American deep-well pump which operates at a depth of 50 feet. It pumps to a 350-gallon pressure tank and is automatically controlled.

Auxiliary pumping equipment which was used to aid in the initial pumping out of the cofferdam was installed on a barge and consisted of two 18-inch steam pumps. The suction lines were run through the spillway flume. The other pumps were set in place as needed by the cableways and when the cofferdam was unwatered they were supported by tripods of steel pipe or hung by block and tackle to the timber bents. All pumping out of the cofferdam is either through flumes or through pipes passing through holes cut in the steel sheet piling.

The Concrete Plant

Aggregate for the concrete on the Montgomery Locks project is furnished by McCrady-Rodgers Co. The barges are brought up to the cofferdam and moored to the lower arm. The aggregate is unloaded from the barges to the Blaw-Knox 200-cubic yard bins by an American 22-ton steam revolving crane with an 80-foot boom and a 2-yard Blaw-Knox clamshell bucket. The bin is a new combination with the cement storage in the same structure; thus there are four compartments in the unit with separate weighing hoppers for the cement and aggregate. There are three independent Fairbanks springless scales for weighing cement, aggregate and water. All batches are mixed a full 1½ minutes and consist generally of 470 pounds of cement, 940 pounds of sand, 900 pounds of 1½-inch gravel and smaller, and 1,700 pounds of 5-inch gravel with 5 gallons of water per bag of cement.

The bulk cement is received in barges and is moved to the cement storage in the Blaw-Knox bin by a Fuller-Kinyon electrically-operated cement pump and compressed air line. An Ingersoll-Rand 350-foot compressor supplies the air for the operation of the pump.

The mixing units are a pair of Rex 2½-yard mixers located immediately below the batchers. The concrete is handled by delivery direct from the mixers to three 5-yard Blaw-Knox bottom-dump concrete buckets which are carried under the mixer chutes on flat cars. There are two locomotives, each with a pair of flat cars for this service. The concrete buckets are picked up by one of the cableways and swung out to the forms where they are dumped into the steel hoppers of double chutes for delivery to the section of the forms desired. Upon return the bucket is spotted on the empty car and the full bucket lifted off. The plant under full operation has produced 80 yards of concrete per hour.

Concrete Forms

Traveling steel forms were used for the footings of the walls and a second set for the upper sections of the walls. The footings were 30 feet above the rock and the top of the upper set 40 feet above rock. Constant

A SECTION OF AN 11-FOOT CONCRETE CULVERT WITHIN THE LOCK WALL

One section has already been poured and the plates removed except for a short section of about 12 courses

adjustment of the steel forms to conform to the changing section of the footings and walls slowed up their use but no other method of concreting would have been as rapid. The best progress in concreting with forms of this type which travel on their own gantry is when the cross-section of the wall or tunnel being poured is uniform for long distances.

All the guide and guard walls were poured on hard wood piling driven to rock. The floor of the locks is to be 6 x 6 concrete blocks, 2 feet thick, laid after the other concrete work is completed and the backfilling finished. The fill on the land side of the land wall is carried to the top of the wall and in all other places it is carried to 2 feet below the top of the footings to permit the setting of the concrete blocks.

The concrete is sprinkled for curing for seven days after pouring. All forms are required to be left in place for 48 hours before stripping and the contractor is required to allow 16 hours between pours of lifts in the same monolith. All concrete is vibrated internally with Jackson concrete placement vibrators to insure the displacement of all air pockets in the mass. On the wood forms for the caissons, which are made up in panels, Universal form clamps and rods are used.

Culverts in the three walls of the locks are provided for filling and emptying the locks. The forms for these culverts which are both half-round and full-circle were originally intended to be of wood with six cross braces. Before actual pouring began the method was changed to use steel culvert plates, 1,000 of which were used on the job. The culverts are 11 x 13 feet inside measurement with the floor level with the wall footers, and there is one in each wall. The use of Truscon liner plates for this purpose permitted easier erection and collapsing than with wood. They gave a smoother finish to the concrete, eliminated the need for cross bracing, permitted easy passage through the forms, gave the necessary strength and rigidity during pouring

and were quickly erected and easily collapsed by loosening a few bolts which permitted their being moved ahead to the next section to be poured. A cheap grade of roofing paper was wrapped around the circumferential joints to eliminate the slight ridge that might be left at the joint of the plates.

ELECTRIC SUPPLY

Electricity for the entire job is supplied by the Duquesne Light Co. which delivers 3-phase current at 23,000 volts to the contractor's transformers. There are three 330-kva 23,000 330-volt single phase transformers. The voltage has been increased to 440 volts as better fitting the operation of most of the equipment. A 37½-kva transformer was installed for 110-volt current for lighting and smaller equipment. A special 100-hp electric power cable is carried direct to the mixer plant.

SHOPS AND EQUIPMENT

A blacksmith shop on the bank of the river is operated by two men per shift. It is equipped with a grinder, an electric forge, a drill press and anvil. No drill steel is sharpened there as the contractor has a complete shop for that service at the Pittsburgh office and a truck from the job makes one round trip daily, carrying the drill steel to be sharpened and bringing back such small supplies as are needed and which can be handled through the Pittsburgh office more expeditiously than directly on the job.

CARPENTER SHOP

The carpenter shop where the more intricate form work was made is equipped with a DeWalt cross-cut circular saw electrically operated, a jointer, a band saw and a Foley automatic saw filer. The shop is operated by one man and a helper. The carpenter crew on the job consists of about twenty men maximum per shift.

LABOR ORGANIZATION

The total force employed on this project for the period of maximum activity which extended over a greater part of the entire construction period is about 225 men on the day shift and about half that number of each of the night shifts. There are therefore a total of around 425 laborers, craftsmen, foremen, engineers, and office personnel active on the job.

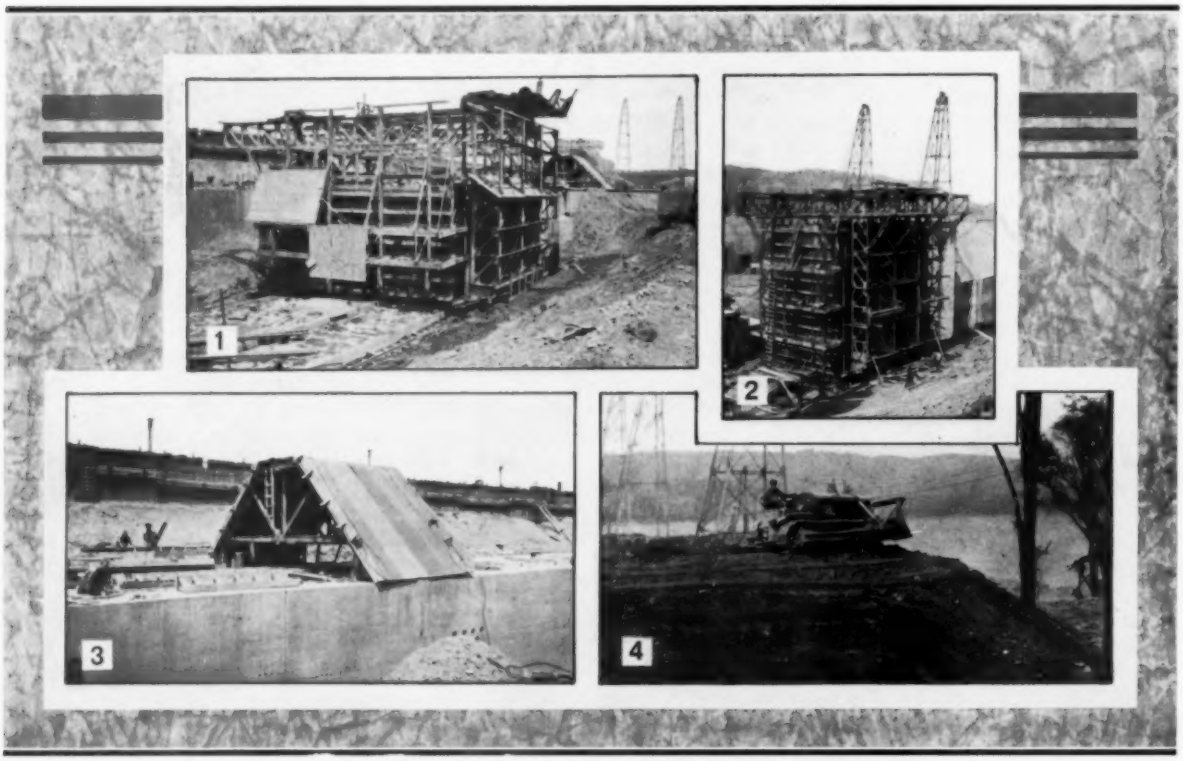
QUANTITIES

Concrete	250,000 cubic yards
Excavation, common	346,000 cubic yards
Excavation, rock	20,000 cubic yards
Fill	196,000 cubic yards
Timber piles, hard wood	88,000 linear feet
Structural steel	320,000 pounds
Reinforcing steel	520,000 pounds
Cast steel armor plate	1,550,000 pounds
Machine steel castings	63,000 pounds
Iron castings	42,000 pounds
Bolts	46,000 pounds
Butterfly valves, four	13 x 14 feet
Butterfly valves, two	10 x 12 feet

LIGHTING FOR NIGHT WORK

A battery of twenty National X-Ray Reflector Co.

(Continued on page 29)



HANDLING THE MASSIVE STEEL FORMS AND BACKFILL

1. *The base gantry and steel forms for the middle wall.* 2. *The upper gantry at the upper end of the land wall. Two of the cableway towers are shown in the upper right-hand corner of Illustration* 1 *and the tops of the same two towers are seen apparently protruding from the gantry in this photograph.* 3. *The A-frame built of armor plate to straddle the walls and permit backfilling by dropping material on it from cableway skips.* 4. *Leveling off the dump of excavated material at the upper end of the lock with a tractor and bulldozer.*

Truck Haulage *on a* Yielding Grade

Frank S. Tillman Experienced Difficulties With Cutting of Grade By Batch Trucks on U. S. Route 10 Job in Wisconsin

A GRADE that gives under the weight of the batch trucks and which, under most conditions, shows a distinct rubbery character under the roller is a difficult one to pave when a truck fleet is used for hauling the batches over the finished grade. Frank S. Tillman of Milwaukee, Wis., was the contractor for a concrete paving job on U. S. Route 10 west of Manitowoc, Wis., last summer where the grade conditions were about as described above. It was necessary in most parts of the work to regrade completely the section between the forms immediately ahead of the paver as it was so badly cut up by the 2-batch trucks dumping into the skip. In spite of these difficulties which are bound to retard the progress of the work, he was able to average about 1,400 feet of pavement a day and complete a mile of paving every four days.

Fine Grade

The fine grade ahead of the forms was shaped by a 7-foot Galion blade grader pulled by a Caterpillar Thirty equipped with a scarifier. Another Caterpillar Thirty with a rotary scraper spread earth on low spots and cut out the high places in the grade and was later used on finishing the shoulder. A foreman with eight men handled the preparation of the form trench after the foreman had set the line. Two form setters, each with a helper, set the 9-inch Metaforms on one side and Blaw-Knox forms on the other side for the 9-6½-9-inch slab. One man checked the forms ahead of the paver and when necessary to reset the forms, he took some of the grade crew from their other work and re-lined the forms.

Eight men roughed in the grade, using shovels and picks and a scratch template or string for checking the grade. This crew was followed by one of six men, about half way from the form setters to the paver, who trimmed the grade as closely to true section as possible. They were called back to the paver to assist the two men normally kept there for filling the ruts cut by the batch trucks, when the grade was particularly bad as shown in one of the photographs. The two men also built up the grade a bit for the crawlers of the paver which in the soil in this section always depressed the grade slightly as it passed over the finished grade. It is much cheaper to use two men continuously building up the grade slightly so that it will be accurate after the paver has passed over it, than to pay for the extra concrete to fill the depressed path of the paver crawlers. These same two men also cleaned out from the Koehring subgrade planer pulled by the Koehring 27-E paver.

Concreting Organization

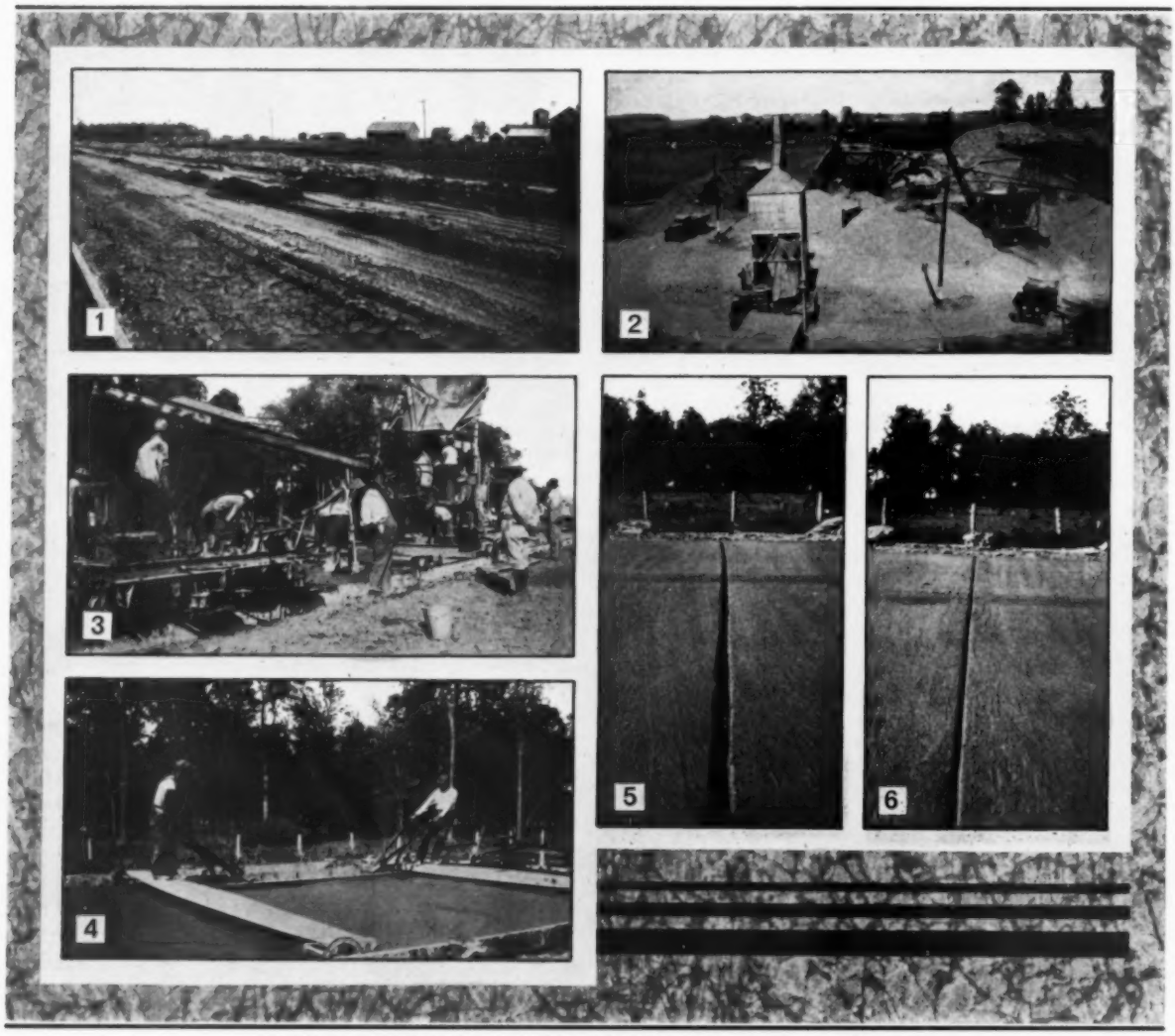
One man oiled the forms ahead of the paver and also oiled the joint strips, the dowels for the expansion joints and the transverse dowels. Two men handled the dumping of the trucks, one handling the actual dumping and the other assisting in cleaning out and also using the pipe device for clearing the skip each time it was up to deliver a batch to the paver. This pipe device was slung on two A frames above the paver tank and, by pulling a rope at the side, the extra man could hit the skip a sharp blow and loosen any sand or cement that adhered to it. One man sprinkled the grade beneath the skip to prevent any dust from the grade getting into the batch, and also sprinkled under the paver and the subgrade just before the concrete was placed. He also helped move the hose.

The Koehring paver had a 27½-foot boom, permitting a wide pit for placing concrete ahead of the Arnold strike-off, which smoothed the concrete for the placing of the reinforcing mesh, and also for placing the concrete on the mesh behind the strike-off. The strike-off was pulled by a 12-foot chain at each form line and

attached to the subgrade planer. Two puddlers were kept ahead of the strike-off and two more puddlers ahead of the finishing machine. As soon as the paver moved ahead 10 feet, pulling the strike-off ahead the same distance, the steel man stepped in and dropped the five transverse dowels and then with the second steel man pulled in the 10-foot square section of reinforcing mesh. The wire mesh order was divided equally between the American Steel & Wire Co. and the Wheeling Steel Corp. All mesh was spot welded, with 6-inch spacing of the wires both ways. These same men set the expansion joints at 90-foot 6-inch intervals, using a special setting machine which held the ten dowels which ran through the joint firmly in place and horizontal until supported by the concrete poured around it.

The concrete was finished by an Ord double screed machine which ran over each section twice to insure as smooth finish as possible and to minimize the work of the hand finishers. The finishing machine carried a cutter wheel for the center joint slot. The setting machine also used one on the front of that machine to insure a clean opening for the insertion of the steel wedge. Immediately behind the finishing machine was a National Steel Fabric Co. hand-actuated center joint setter with an operator, who placed the transverse joint and used a small burlap drag across the joint to take out the finishing marks and thus leave a uniform surface texture. This was followed by two bull-float men working from a twin rolling bridge.

Two edgers, two straight-edge men and a man who pulled the center joint steel completed the finishing crew. The two edgers finished the sides and helped the straight-edge men and used a belt as necessary. The straight-edge men used 10-foot drag straight-edges to eliminate any bumps in the pavement before they be-



PAVING METHODS ON A NORTHERN WISCONSIN CONTRACT

1. Subgrade troubles—plastic material badly cut up by batch trucks. 2. The contractor's batching set-up at a commercial pit, the producer's plant shown in the background, the contractor's two aggregate batching plants at the left and right and the bulk cement plant in the foreground. 3. Working close together—the paver and finishing machine right on top of the pit and showing vigorous spading along the forms. 4. Carrying a ridge of grout across the slab with the bullfloat. 5. An expansion joint finished and ready to be poured later. 6. A narrow transverse dummy joint.

came permanent affairs. The last man in the finishing crew pulled the center joint steel, edged the slot and carried the steel forward. He did the same for the transverse joints which were placed midway between the expansion joints. The edgers also built lip curb when on grades or fill. As this was a very flat section there was little lip curb encountered. Concrete for building lip curb was carried back by a team, using a stone boat and half barrels. The team worked both sides and also hauled the burlap forward each morning as the slab was uncovered for checking and then for the final earth cover for curing.

Two men sprinkled the burlap before and after placing and kept it laid close to the finishing operations so as to prevent any chance of hair cracks due to quick drying from the strong winds in that section. A conversation with a meteorologist at Appleton, Wis., brought out the information that the evaporation from Lake Winnebago which extends from Appleton to Fond du Lac, a distance of approximately 31 miles, amounts to as great as ¼-inch per day when the wind is strong and the sky clear. This is equivalent to a flow of 800 second-feet which is greater than the entire flow of streams entering the lake. Evaporation as great as this can be very destructive to concrete that is not properly protected soon after finishing.

The day following pouring four men pulled the forms and loaded them onto flat bed wagons hauled by teams. There was a team outfit on each side. These crews worked the morning shift only. Following these, eight men covered the pavement with earth and three or four did the sprinkling for seven days. On odd days when no other work could be handled by the hand labor crews, about eight men with shovels were used to uncover the pavement which had been cured for at least eight days. They were able to uncover about a mile of slab a day.

Water Supply

Water was supplied for the mixer and for sprinkling by two triplex pumps working from small creeks dammed to form pools. A Rex vertical triplex and a Barnes horizontal triplex made the team which delivered the water through a 2-inch pipe 5½ miles long laid along the shoulder. The taps were placed about 550 feet apart in the line and the paver carried 350 feet of 1½-inch heavy-duty hose.

The Batching Plant

The batching plant for this job was located at the pit of the producer so that the contractor's cranes handled the aggregates direct from stockpiles made by the producer. The long haul for the batch trucks was 8½ miles and the short haul or actual dead haul was 3 miles. There were twenty-two two-batch trucks for the maximum haul and twelve for the minimum haul. As the specifications called for three sizes of gravel and also sand, the contractor used two 2-compartment bins. The first under which the trucks backed was a Johnson bin and batchers which contained the coarse gravel and the sand, then the trucks drove out and received the cement at the Butler bulk cement plant and then backed under the second batcher, a Blaw-Knox batching plant which handled the fine and middle-sized gravel. These two bins were served by a pair of Koehring cranes. The cement was placed between the two loadings of aggregate so that it would not blow off during transportation. The batching organization consisted of one man operating each crane, a batch man for each batching plant, a delivery man for the cement, a weigh man for the cement and a man handling the delivery chute to the trucks.

In driving to the site of the work the trucks used cross country roads, which are abundant in this section of the country, and were thus able to reach the approximate position of the paver with a minimum of driving on the grade. They drove to the paver on the grade, turning through openings in the forms and, after delivering their two batches, drove out through the forms and back on the shoulder.

Personnel

This section of U. S. Route 10 was paved by two contractors in the summer of 1933, the work being divided into three parts with Frank S. Tillman of Milwaukee, Wis., doing the middle section. Mr. Tillman acted as his own Superintendent. For the State Highway Commission, G. E. Hill was Resident Engineer.

Building Montgomery Locks

(Continued from page 26)

floodlights with 500-watt lights are moved around the cofferdam as required to furnish light for the operation most active at the time.

Personnel

The locks of the Montgomery Locks project are being built by Booth & Flinn of Pittsburgh, Pa., for whom the work is under the supervision of A. Rex Flinn, President, George Hockensmith, Vice President and General Superintendent, with Norman McLeod, Field Superintendent. M. W. Murphy is Assistant Superintendent, John Kuer, Chief Engineer and R. F. Furr, Assistant Engineer in the field. The work is being done under the direction of the Pittsburgh District Office, Engineer Corps, U. S. A., Major W. D. Styer, District Engineer. Don P. Keelor is Resident Engineer on the project.

EXCAVATION AT GRAND COULEE DAM

Two Caterpillar diesel Seventy-Fives with Le Tourneau 12-yard scrapers hauled 9 cubic yards of sand per load a distance of 2,200 feet on the Roland Construction Co. project

The Lubrication *of* Prime Movers

The Third of a Series of Articles on an Important Phase of the Maintenance of Construction Equipment

THE internal combustion engine has practically replaced the steam engine as the prime mover or power unit on construction equipment. Its ability to generate greater power with a lesser fuel cost, combined with compactness and diminished weight, has popularized it with great rapidity in recent years.

The lubrication of engines of this type is an important factor in operating costs. Improperly selected oils result in excessive repairs and replacements, as the oil is required to lubricate many diversified parts and bearings, the operation of which are radically different. Some involve sliding surfaces, others revolving, while still others are of the oscillating type. Some of these bearings operate at high speeds while others operate at relatively low speeds. Again many of the bearings are comparatively small but carry excessive loads for their size.

Most manufacturers of internal combustion engines conduct extensive and exhaustive tests of various oils to determine definitely the grade best suited for each type of engine, incorporating their recommendations in their instruction books. It has been the practice in more recent years to make their designations by the numbers established by the Society of Automotive Engineers, which are as follows: S. A. E. No. 10, S. A. E. No. 20, S. A. E. No. 30, S. A. E. No. 40, S. A. E. No. 50, S. A. E. No. 60 and S. A. E. No. 70. Each of these numbers represent a certain viscosity range, being known technically as "S. A. E. Viscosity Numbers." The range of these viscosities is as follows:

S. A. E. Viscosity Number	Viscosity Range Saybolt Universal, Sec. At 130 Degrees F. Minimum	Maximum	At 210 Degrees F. Minimum	Maximum
10	90	Less than 120	...	...
20	120	" " 185	...	...
30	185	" " 255	...	...
40	255	...	...	Less than 75
50	...	...	75	" " 105
60	...	...	105	" " 125
70	...	...	125	" " 150

The S. A. E. viscosity numbers constitute a classification of crankcase lubricating oils in terms of viscosity only. Other factors of oil quality or character are not considered. The viscosity range of each number is sufficient to include the various types of oils from different fields.

The recommendations of various engine manufacturers are approximately from S. A. E. No. 30 to and including S. A. E. No. 70, based on the size of the engine and the duty it is expected to perform as well as the mechanical conditions of the engine. At the present time tests are being made by engineers which may possibly change present recommendations of crankcase oils. These tests have so far shown that probably lighter oils will be found to be more efficient and more economical than the oils now recommended. They have demonstrated that lighter oils will reach all bearing parts quicker than the heavier oil, thereby affording immediate lubrication and preventing unnecessary wear. Furthermore, as most bearings have close clearances, the lighter oils will circulate more freely between the bearing surfaces, materially reducing the friction and diminishing the wear. This has resulted in reduced temperature of the oil itself to from 60 degrees to 85 degrees F. in the crankcase, while the engine is in operation.

There will be a greater consumption of the lighter oil during a given period, by approximately 20 per cent, which will be more than offset by the savings which accrue from reduced fuel consumption, which is approximately 6 per cent. This, combined with the prolonged life of the bearings, has created substantial economies during the period of these tests, which have been carried on for over nine months. These tests will be concluded by early summer, when very interesting data will be available.

Influence of Crudes on Finished Oils

Many operators are inclined to believe that the value of a motor oil is dependent entirely upon the crude from which it is refined, and each of the fields from

which crude oil is produced has its many adherents. The locality of the producing field is not as significant, in itself, as is the grade of the oils refined from that particular crude, which are offered to the buying public. To clarify this statement, we will use as an example Pennsylvania oils, which have received extensive publicity in recent years. Unquestionably, Pennsylvania oils possess exceptional lubricating properties, but the fact that an oil is a derivative from a Pennsylvania crude does not signify that all grades of this oil are adapted for the lubrication of internal combustion engines, as different grades are obtained in the process of refining, ranging from light spindle oils to heavy cylinder stocks. The oil must be of sufficient high viscosity and possess a comparatively high flash and fire test to meet the requirements of the engine to be lubricated. This applies to all crudes as well as Pennsylvania crude.

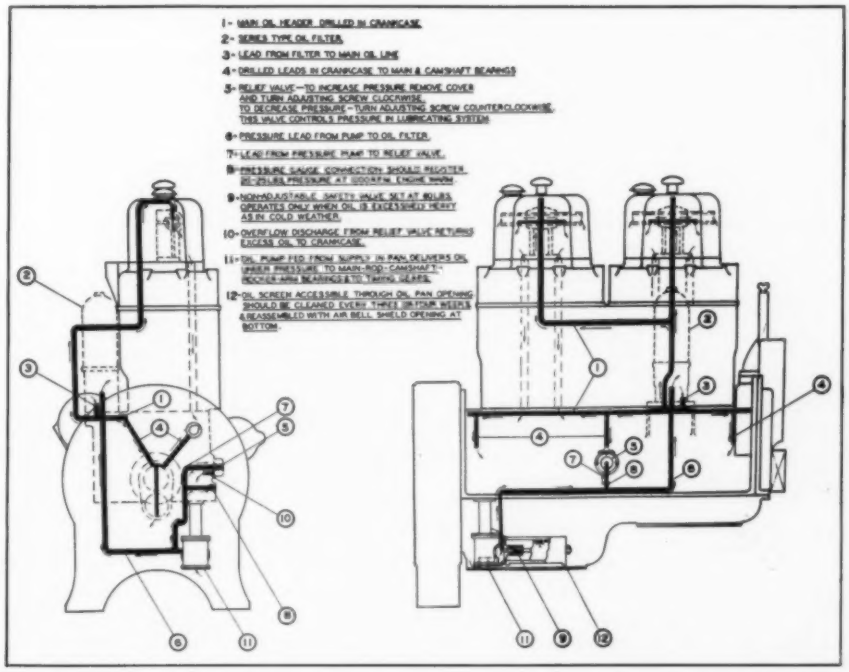
The extensive advertising and publicity which has been given Pennsylvania motor oils has brought into the market many "gyp" oils which are sold as "100 per cent Pennsylvania Oil" at prices so low as to brand them immediately as very inferior in quality. Such oils should be avoided, as frequently they are destructive to the fine mechanism of an engine and often cause irreparable damage. While these oils may be rightfully classified as 100 per cent Pennsylvania oil, they are invariably not properly refined or blended, nor are they consistent in their standards.

The value of different oils derived from the various crudes is dependent upon the characteristics which are mostly desired by the consumer. The California crude has an asphalt base, and the finished oils are referred to as asphalt base oils. The lubricating oils made from this crude have very similar characteristics to those obtained from Gulf asphalt-base crudes. Their viscosities are very susceptible to heat and have a comparatively low flash-point. The cold test is very low. Gulf crudes, of the asphalt-base type, are produced in Texas and Louisiana. They have a higher gravity than California crudes, and the finished oils have a better flash-point, although the cold test is not quite as low. The viscosity of these oils does not break down under heat as rapidly as the California oils. In connection with the subject of asphalt-base oils, it should be understood that during the refining process the asphalt is removed before arriving at the finished oils.

Mid-Continent crudes are generally of the paraffin-base type, though a certain volume of asphalt-base crude is produced in certain sections. The gravity of these oils is higher than those produced in California and the Gulf States, and the lubricating oils obtained from these crudes have greater heat-resisting properties than the asphalt-base oils, but not as low a cold test.

Pennsylvania crude is of paraffin-base and has the highest gravity of any of the crudes mentioned. It is practically free from impurities, which simplifies its refining. The cost of this crude in the field is always higher than the prevailing prices for other crudes, and lubricating oils derived from Pennsylvania crude bring a higher price on the market because of their excellent lubricating properties. These oils have unusual heat-resisting properties and maintain their viscosity at unusually high temperatures. Until recent years these oils have had a comparatively high cold test, but with the advent of new refining processes and improved methods of dewaxing and filtration the cold tests have been materially reduced and they may be used satisfactorily during all seasons of the year.

Each of the types of oils referred to carry with them a large following of consumers, and each has to base his selection on the particular merit each oil may possess. If a low cold test may be a dominating factor, this may be obtained with the asphalt-base oils. The Mid-Continent oils may be considered as being in the middle class, with a comparative low cold-test and fair



A Schematic Oiling Diagram for a Typical 4-Cylinder Gasoline Engine

Illustration, Courtesy of Waukesha Motor Co.

heat-resisting properties, and offer very good lubrication. The Pennsylvania oils have the greatest heat resistance, best lubricating properties, and many of the better and more favorably known brands have a satisfactory cold test, but first costs are higher than the first two mentioned. Regardless of the type selected, the buyer should fortify his personal interests by purchasing those oils which are produced by reputable refiners or blenders.

The Danger of Using Low Price, Low Quality Oils

Appreciating the ever-present demand for products which sell at lower prices than are obtained for similar products with established reputations, some of the smaller refiners of petroleum have and are producing vast quantities of poorly refined oils, which are being marketed through certain jobbing channels to various dealers, service stations, and consumers. Some of these inferior oils may be sufficiently viscous to meet the S. A. E. viscosity numbers with which they are branded, but from the viewpoint of value, that fact is insignificant. Oils of this character usually carry many impurities which are injurious, such as free asphalt, excess quantity of wax, free sulphur, sulphuric acid, etc., any of which, even in small quantities, will create trouble and damage far in excess of any saving involved through their purchase at low prices.

The reputable refiner spares no expense or trouble to produce the best oils possible from his crude and when they are marketed, they are free from any deleterious matter of any description. Their expertly manned, extensive laboratories thoroughly check all finished oils against their standards before the oil is released for shipment. They surround themselves with every safeguard to protect their reputation, and that of their product, which involves excessive expenditures.

Diesel Engine Lubrication

The diesel engine is increasing in favor for industrial purposes. There are many designs and types on the market at the present time and continual changes are being made in those which have already been developed, which has a direct bearing on the grade of oil which should be used for their lubrication. Diesel engines require a higher grade or higher quality motor oil for efficient lubrication than gasoline engines, due to the heat diesel engines develop. It has been found that ordinary motor oils which have given satisfactory performance in an automobile engine or other gasoline engines fail to stand up in a diesel engine. Therefore the diesel engine oils should be selected with particular care so that only oils of known heat-resisting qualities which are free from light ends, asphaltum and resinous products, do not distill and are not readily diluted, should be used. During this period of development of the diesel engine, the manufacturer's oil recommendations as to specifications should be closely followed by the operator.

Electric Motors and Generators

Electric motors and generators demand specially selected lubricants for efficient and economical lubrication. Very frequently these units are operated with an overload of from 25 to 50 per cent above their rating and when such practices are consistently followed, it is essential that the better types of lubricants be used to offset as far as possible such abuses by reducing the friction load to a minmum.

Units of this class are constructed with ring or chain oiling bearings, ball or roller bearings, or plain sleeve-type bearings. The first two mentioned are the most popular, as they require less attention than the latter. The ring or chain oiling type of bearings requires a fluid lubricant to permit of the free functioning of the rings or chains, which carry the lubricant from the reservoir to the surface of the shaft.

There are numerous types of oils offered for this purpose, as well as light fluid grease lubricants, and selection should be based on the size of the motor and the duty it is required to perform. For small, light-duty motors of the ring or chain oiling type, the lighter oils should be selected. The larger heavy-duty motors require lubricants of greater body and the more viscous oils or light-bodied grease lubricants are essential. Care must be exercised not to select a lubricant of too high a viscosity in the belief it has the propensity to withstand greater pressures. A too viscous oil would not be sufficiently free-flowing to permit the free delivery of the oil from the rings to the journal, and permit of its free circulation and cooling when it is in the reservoir. This results in overheated bearings and excessive wear of bearing parts.

Most of the cheaper and inferior oils are inclined to vaporize and the vapors are carried to the windings of the motors which eventually become saturated, necessitating rewinding. Furthermore, such oils of light viscosity are very apt to creep along the shaft in sufficient volume to be thrown on the armature, with the above results. These types of oils are susceptible to excessive foaming through the action of rings and chains, causing them to overflow, creating considerable waste of the lubricant and an unclean condition. The better types of lubricants last longer and therefore require replenishing at less frequent intervals. They tend to prolong the life of bearings and reduce repair expense to a minimum.

Ball or roller bearing motors require a grease lubricant of medium consistency, which does not permit of channeling, or retarding the normal functioning of the balls or rollers. Ordinarily bearings of this type consume but a small quantity of lubricant, and the expense involved in lubricant cost justifies the use of the best grade of grease lubricant obtainable. It is essential that such a lubricant should be free of fillers of any character which would tend to create undue wear. It should be free from acids which would attack and pit the metal surfaces, incurring early replacements. The manufacturers of bearings of this type invariably approve the use of only the best grades of lubricants.

Motors which are exposed to unusually high temperatures should be lubricated with a sodium-base grease lubricant, that it may retain its original consistency under the abnormal heat condition. Some high-temperature greases are manufactured with a combination calcium and sodium base, which have been found to be very satisfactory when extreme high temperatures are not involved.

(*Continued on page* 40)

The Editor Comments

Personal Observations and Reflections

Again the Automobile May Stimulate Lagging Highway Construction

It was the automobile that put good roads on the map, because a right-of-way filled with chuck holes might be navigated with a horse and buggy without too much difficulty, but the automobile with its smaller wheels required a smooth highway. The rapid increase in ownership of automobiles and the banding of motorists into national associations demanding good roads stimulated the great bond issues which made our present network of 150,000 miles of hard surfaced roads possible. Since 1931, however, the road program has lagged sadly because of continuously increasing diversion to welfare work of funds collected for highway construction and maintenance from the Gas Tax.

The 1934 Automobile Show in New York City brought about an interesting headline in the New York *World-Telegram*, "Public Looks For New Roads to Match Cars— Asks What's the Good of Potential Speed That Can't Be Used." Charles M. Sievert, Automobile Editor said, "Increased horsepower, greater speed and accentuated streamlining, emphasized so definitely in the 1934 models at the Automobile Show in Grand Central Palace, suggest the lack of compatibility between highway construction and automotive engineering. Where, asks the public, are the roads for which the new models were made to travel 70 and 80 miles per hour? The nation at present appears to be suffering from acute highway inadequacy. It has 2,000,000 miles of mud roads and scarcely 150,000 miles of high-type pavements, according to the American Road Builders' Association estimates.

"Greater speed with safety requires improved highways with fewer or no intersections, banked curves and elimination of hills. The motoring public, to be sure, willingly accepts a car with rapid acceleration and a body designed for comfortable riding. It likes to rest secure in the knowledge that at least, if ever required, its motor cars can attain a speed of 80 miles an hour or more. But until the highway network of the nation is greatly expanded, modernized and improved, the talk about streamlining to reduce wind resistance, encountered chiefly at high speed, can be subdued."

The State Highway Departments, under the able guidance of the U. S. Bureau of Public Roads, must furnish the new mileage of wider hard-surface roads with banked curves of long radii to care for the renewed demands of organized motorists.

Public Works Projects Should Be Chosen to Benefit All

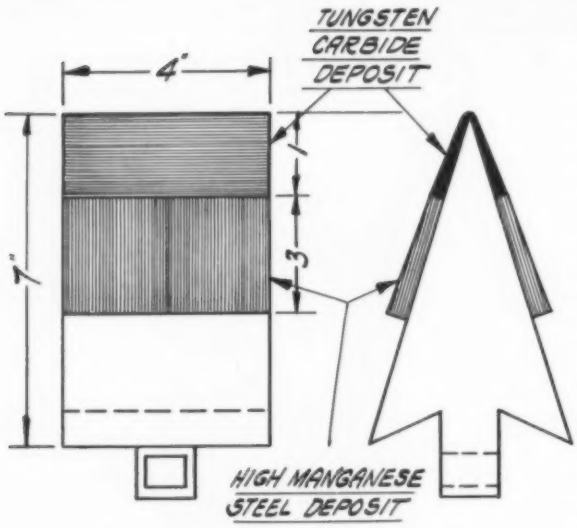
The money which is being expended so freely by the Federal Administration in so-called public works must be collected from the pocket of every one of our 132,000,000 population. Therefore, in so far as possible, only such projects should be undertaken as will benefit large groups of the population without respect to class. Projects must be utilitarian, of which our highways furnish an outstanding example. There is an increasing tendency on the part of the Federal Administration to allocate funds for projects which Congress itself a year or more ago definitely ruled out.

The taxpayers of this country must demand the expenditure of money for more utilitarian projects than the mere decoration of pork barrel post offices. The projects must be those which will employ many directly and indirectly—directly in the form of labor and indirectly in the employment of machinery in the manufacture of which many skilled craftsmen are required. One of the most wholesome utilitarian undertakings for which federal funds can well be employed is the wholesale elimination of railroad grade crossings. Not only will this employ large bodies of workmen and construction equipment but it will benefit the people of the United States, whether they travel by railroad or motor vehicle, and will save many lives through the elimination of one of the worst hazards of modern travel.

New York Tunnel Bids Uniform

On February 21, the Port of New York Authority received bids from five contractors for constructing the 38th Street Tunnel to be completed by March 1, 1937. Although the low bid of $6,452,300 from Mason & Hanger Co. was nearly $941,000 lower than the second bid, the three middle bids were within a range of $21,500. Engineers estimated that the active plant owned by the low bidder fully offset the difference in the bids, showing the careful bidding in the total, although some of the individual items varied widely.

Theodore Reed Kendall



The Method of Resurfacing Shovel Teeth

Increasing the Life of Construction Equipment

WHEREVER there is abrasion, there is usually rapid wear and the wear on metal parts of equipment used in the construction industry is a particularly important problem since frequent replacement of worn parts constitutes the major cost of such equipment. Such parts as dipper teeth, tractor treads, scrapers, rock drills, scarifiers, shovel buckets, bulldozers, plow edges and trencher parts are all subjected to excessively hard wear, and repair and replacement are often necessary, frequently at a time when speed and maximum production are most important.

The life of such parts of equipment and others subjected to the same sort of intensive wear may be lengthened from two or three to ten or fifteen times by hard facing. Hard facing is the application of a layer of dense wear-resisting material to the metal in service by the use of welding equipment. Since this wear must start at the surface, a surface protection is all that is necessary. For applying hard surfacing materials, the welding machine used for general maintenance work and special electrodes or surfacing materials are all the equipment required.

The Hard-Surfaced Teeth on This Digger Lasted Three to Ten Times as Long as Ordinary Teeth

Many examples of the savings made by hard facing may be cited. Digger and shovel teeth used on a mid-western job were found to wear twice as long after hard facing and the cost was one-fifth that of replacement. In digging a 60-inch ditch 10 feet deep through a hard formation including much sandstone, plain tempered teeth lasted 4 to 16 hours. Hard faced teeth lasted 40 hours.

In general, there are three methods used for hard surfacing by the electric arc process, depending on the material to be faced and the service requirements. For building up worn manganese steel parts, a high manganese steel electrode is used. For building up steel parts to produce a surface of moderate hardness to resist shock and abrasion, high carbon steel electrodes are utilized. Where a super-abrasion-resisting surface is desired, the use of tungsten carbides applied with the electric arc is generally recommended.

When welding manganese steel, a coated electrode should be used to prevent the escape of the manganese and carbon. The best manganese steel electrodes produce a weld containing from 11 to 15 per cent manganese and provide a shielded arc to allow the transfer of molten metal to take place under non-oxidizing conditions. A high carbon steel electrode containing about 1.00 per cent carbon is used for numerous hard surfacing applications. Unless allowed to cool slowly, or annealed, such welds are not machinable and must be ground to shape, if shaping is necessary. The exact hardness of the deposit depends upon the rate of cooling and also upon the carbon content of the steel being built up. Peening the completed bead will harden the deposit somewhat.

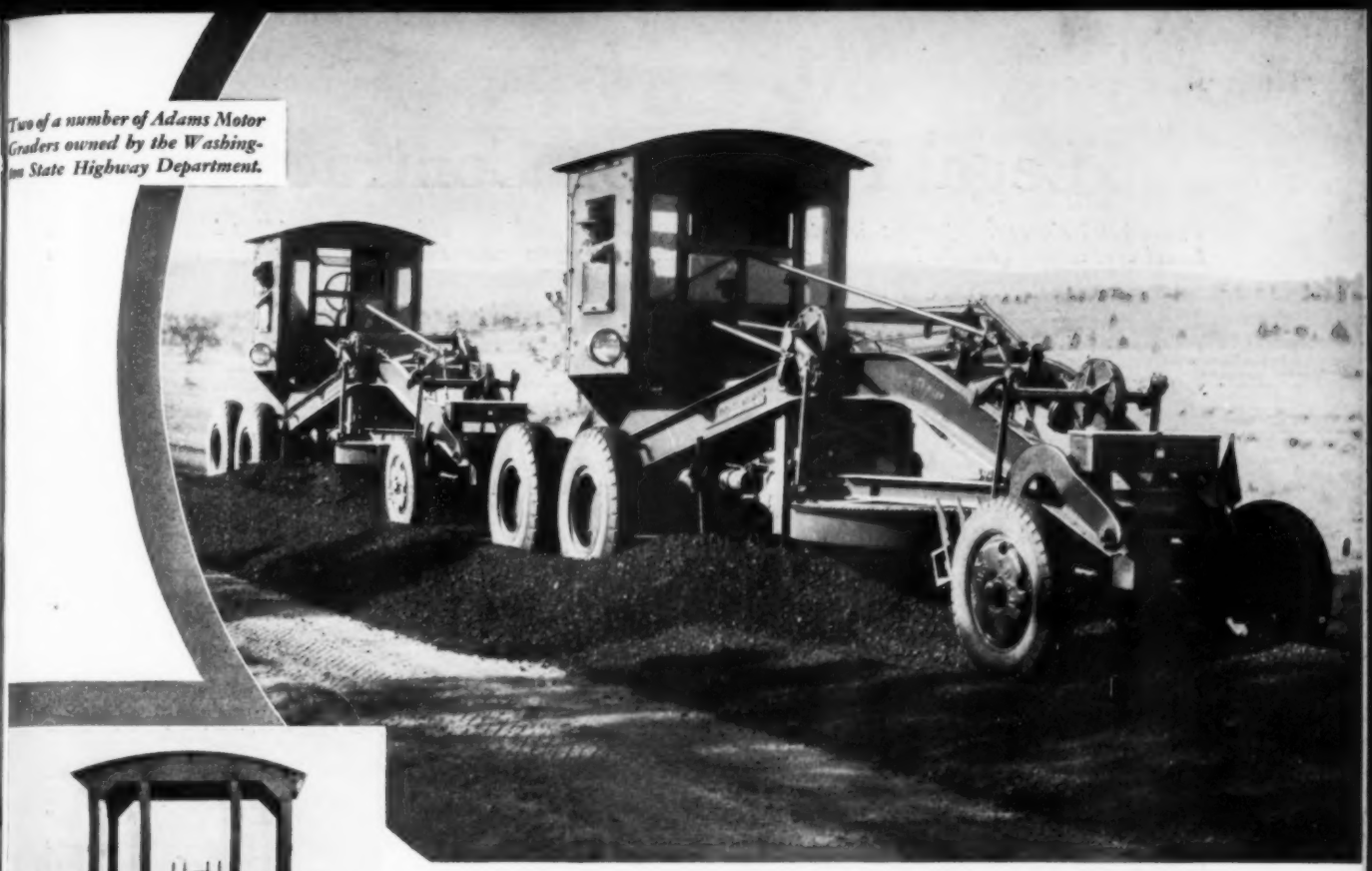
Where an extremely hard surface is desired, the application of tungsten carbides with the carbon arc has found wide acceptance. Practically all such materials are patented and sold only under trade names. Granular tungsten carbide finds its most practical applications in the facing of bits, teeth for ditch diggers and power shovels, road scrapers, maintainers, crusher blades and similar parts.

One of the important things in the facing of any tool for abrasion resistance is the fact that the savings in time of changing is often just as or more important than the increased life of the tool. Hard facing is especially economical where only a portion of the total weight of the tool is worn away. If it is not resurfaced, the whole thing must be discarded. Frequently by hard surfacing, even though it may almost equal the cost of replacement, there is an important saving in time which will be invaluable to the contractor in the prompt completion of his contract.

EDITORIAL NOTE: The illustrations for this article were furnished through the courtesy of the Lincoln Electric Co.

Coming Articles

Among the outstanding articles to appear in coming issues of CONTRACTORS AND ENGINEERS MONTHLY *are an account of the foundation operations for the San Francisco-Oakland Bridge; a description of an unusual grading job up the side of a canyon in Texas; a study of the proper selection of tires to secure the maximum efficiency and economy in truck hauling; and, in each issue, one of our series of articles on the lubrication of the various pieces of construction equipment.*



Two of a number of Adams Motor Graders owned by the Washington State Highway Department.

When eight drive wheels are used the wheels are mounted in pairs on the four axles driven by four enclosed drive chains. Eight wheels are an advantage on earth road work in that they provide more supporting area for soft ground.

POSITIVE TRACTION *with* ADAMS TANDEM DRIVE

WHEN the load is heavy and the "going" is soft or uncertain, you can depend upon Adams Tandem Drive to take you through. The drive wheels grip the ground at four points five to six feet apart—each wheel is independently driven—each helps to pull the others over soft or slippery spots.

Adams Tandem Drive can be furnished with four or eight wheels on any model Adams Motor Grader, and, in several respects, is superior to any similar drive offered. All wheels have equal traction on smooth or uneven ground. All driving mechanism is completely enclosed against dirt and dust. The independent drive of each wheel insures maximum driving power under all conditions.

Write today for catalog fully describing this feature and the Adams line of motor graders.

ROAD ADAMS MACHINERY

The Adams Line also includes Leaning Wheel Graders, Elevating Graders, Dump Trailers, Retread Machines, Road Maintainers, Rotary Scrapers, Road Rippers, Scarifiers, Plows, etc.

J. D. ADAMS COMPANY

INDIANAPOLIS MEMPHIS KANSAS CITY SPOKANE ATLANTA
DALLAS ST. LOUIS OMAHA SAN FRANCISCO MINNEAPOLIS

ADAMS MOTOR GRADERS

Legal Points for Contractors

These brief abstracts of court decisions in the contracting field may aid you in avoiding legal difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt consult your own attorney

Edited by A. L. H. Street, Attorney-at-Law

Contractors' Responsibility to Supervising Engineers

Fifty-five thousand dollars, plus interest, court costs, attorneys' fees, etc., is what it cost somebody because a resident engineer in charge of the construction of a state highway bridge was seriously injured, through giving way of a plank on which he stepped, precipitating him to a creek bed below.

The accident happened on a temporary structure erected to facilitate the construction of reinforced pillars, etc. Sustaining an award of damages against the general contractors, and deciding that the jury was warranted in finding that the accident occurred through the contractor's negligence, the California District Court of Appeal said, in an opinion filed April 10, 1931, in the case of Christy v. Ulrich, 298 Pac. 135:

"The work was being performed upon a public highway right-of-way; the respondent was a state employee assigned to the highway division of the State Department of Public Works; his duties, at the time of the accident, were to inspect the work under construction; and, for this purpose, it was necessary for him to go upon the scaffolding and other portions of the work as it progressed. Immediately preceding the accident, he was inspecting the pouring of concrete in 'Bent No. 3.' He saw that the tamper was broken and that the tamping of the concrete was not being done properly. He volunteered to get the workmen another tamper, and was injured while returning with that implement. In this he may have been acting outside the scope of his employment, but it must be remembered that he is not suing his employer in this action for injuries caused during the course of employment. He is resting his case on the negligence of the contractor. It is conceded that it was his duty to inspect all portions of the work, and the fact that he was voluntarily carrying a tool to the workmen while passing over the main runway does not alter his status as an invitee."

Bids Presuppose Prompt Acceptance or Rejection

"We'll lath and plaster that house for you for $5,265," wrote a plastering company to a general contractor on October 23.

"You may proceed with the preliminary work, pending signing of contract for $5,265," replied the general contractor in a letter written several weeks later.

The next morning the plastering company telephoned the general contractor: "Sorry, but we do not care to proceed until we have a written contract."

Three months' silence intervened.

"Here's that written contract mentioned in our previous negotiations," wrote the general contractor in February.

"Declined with thanks," replied the plastering company. "Our offer was made last October, on an assumption that it would be accepted or rejected within a reasonable time. Had that been done, we could have protected ourselves on material costs, etc., in a way that we cannot now do."

"See you in court," was the reply.

A trial judge decided that the plastering company was in the right—that the general contractor had failed to accept the plastering company's offer within a reasonable time. And the Michigan Supreme Court decided that the trial judge was right. (Clore v. Zimmerman, 247 N. W. 177).

Insuring Buildings in Course of Construction

"We'll insure your house against fire for a certain sum," said an insurance company to an owner of a building under construction. "But you are not to carry any other insurance on the building, excepting such as may be mentioned on the face of this policy. If you carry any other insurance, except as noted on the policy, our policy is to be void."

"Agreed," replied the owner.

But when a fire occurred it appeared that the contractor had taken out a policy for his own protection, without the owner knowing anything about it. Then, the owner's insurance company tried to get out of paying the amount of its policy. It relied partly on the fact that the building contract provided that the owner should carry insurance for the benefit of the contractor.

In the case of Automobile Insurance Co. v. Teague, 37 S. W. 2d, 151, decided April 15, 1931, by the Texas Commission of Appeals, it was declared that there was no "double insurance" in this case, within the meaning of the standard insurance clause that a fire policy shall be void if "*insured* now has, or shall hereafter procure any other contract of insurance," unless otherwise agreed on the face of the policy.

When Original Plans Are Changed, Watch Your Step

Here is a chance for any contractor to learn an important law lesson or two at the expense of a brother who had to go to court to learn them.

A Detroit contract for a house, garage, etc., called for a one-story garage. The contractor ordered steel joists as part of the needed material. Before the joists were delivered the contractor and the owner agreed on a two-story garage. That eliminated the need for the joists, and the contractor was denied right to recover their cost. Nor was he permitted to recover as an extra for pilaster piers made necessary by the changed plans. He had failed to insist upon an agreement with the owner on these points.

The contractor also insisted upon allowance for other claimed extras. Some of these items were allowed, and others disallowed. The controversy over these items was made possible because the contractor did not take the precaution to have them covered by written agreement, as called for by the principal contract. Said the court on this point (Michigan Supreme Court in Banwell v. Risdon, 241 N. W. 796):

"Defendants [the owners] contend that changes, if any claimed to have been verbally authorized, cannot be allowed because of the following provision in the contract: 'It is agreed that all changes, which may add to the cost of the proposed residence, shall be agreed upon in writing prior to commencement and shall be added to the final payment under this contract. An estimate of the cost is to be furnished for these extra items.' This was a wise provision, if lived up to, but did not prevent the parties thereto from dealing otherwise by mutual consent. It does, however, place upon plaintiff [the contractor] the burden of establishing by convincing evidence that changes charged for and not authorized in writing were in fact authorized by verbal agreement, *inclusive of full understanding of call for payment thereof.*"

How the Other Fellow Did It

Ideas That Have Already Proved Helpful to Contractors

Shooting Muck in Michigan

289. On a paving job which required the removal of 1,000,000 cubic yards of sand, and taking care of a number of muck holes, the contractor found one way of handling the muck most effective. First a trench was shot along the line of the right-of-way and 20 feet to either side of the center line of the fill. A fill was then put in to about 7 feet above the final grade, 2-inch pipe was driven through the surcharge into the muck and two sticks of dynamite exploded to form a chamber. Then the hole was loaded with about 30 sticks and shot. The holes were spaced about 10 feet apart and were about 20 feet out from the center line of the fill. A well driller was used to drive the pipe, with a metal plug at the lower end of the pipe instead of the usual wood plug for this type of muck work. The metal plug cut through old logs and other obstructions where the wood plug would have simply splintered. The plug was shouldered to fit the end of the pipe, giving added strength. If the major blasting did not show satisfactory results, a third drilling and blasting was resorted to with the surcharge carried about 5 feet above the finished grade. 25.6.20

Light-Weight Wooden Floats and Straight-Edges

290. A Michigan contractor made up a set of long-handled floats and wooden straight-edges for his finishers. These were made in the contractor's shop and when first delivered to the road were altogether too heavy for even the huskiest finisher to use continuously throughout the day. During the first noon hour one of the men borrowed a bit from the tool box of a fellow laborer and bored several dozen ¾-inch holes in each straight-edge and float, greatly lightening the burden. This also made them much less liable to warp during use on the road as the moisture was rapidly dissipated through evaporation due to the increased surface area. 25.4.29.

The Tool Box and the Care of Equipment

291. Tool boxes are among the most important pieces of equipment on a job. We find them as houses built on old truck chassis, as steel units mounted on trailers, as the common wooden tool box carried about by two men and, with increasing frequency, we find special tool boxes mounted on pavers and finishing machines. A Minnesota contractor had a tool box mounted on the bridge used by the finishers, containing a plane for truing the drag straight-edges, extra gloves, a hack saw to cut a piece of reinforcing bar which did not fit into a certain location at a bridge or around a manhole, pipe fittings, wrenches, a saw and many other tools that it is well to have handy in case of emergency. The finishing machine was covered with sheet metal housings all the time to protect the machinery and the operator was given one-half hour overtime each day to clean and grease the machine so that it would be ready for maximum production the following day. At night two men greased all of the machinery on the job by the light of two gasoline lamps and these men also watched the lighted bomb torches at all barricades to prevent accidents to careless drivers. One of these men worked 12 hours and the other 4 hours one night and then reversed the time the following night to get in their eight hours. This is the kind of planning for maintenance that pays dividends in the elimination of breakdowns and the prevention of damage suits because of accidents. 25.5.15

A Steel Box for Lip Curb Concrete

292. We have discussed many methods of depositing the concrete along the shoulder for use in building up lip curb in the Middle West but here is a new one which proved very satisfactory. Two men with a steel box, of about 1-cubic foot capacity and equipped with pipe handles, carried the concrete back from a batch dumped on the old slab on a concrete widening project. Instead of shoveling the concrete from the pit into mortar boxes or wheelbarrows, the contractor chose this method as he claimed he is able to select a better batch for the curb builders. Wet concrete does not work well in building lip curb as it is always made on a grade and any excess water that is worked out by the hand floats of the finishers will run down the grade and leave a noticeable streak on the slab. The two carriers dumped the concrete along the forms so that it did not have to be shoveled again. 25.4.20

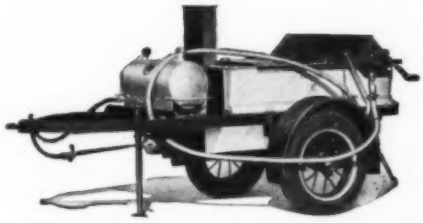
Fast Handling of a 12-Car Train at the Batching Plant

293. With several 6 per cent grades along the right-of-way, a Michigan contractor maintained booster locomotives at several points on a 13.15-mile paving contract. A most interesting part of this work, and one which showed particularly good management because it speeded up the loading of the train, was the handling of the twelve cars in two 6-car sections at the batching plant. When a 12-car train approached the batching plant down grade, the first six cars ahead of the locomotive were taken by the yard locomotive and run through to the batcher by way of the receiving track. After loading they were run onto the outbound track to the cement cars where they were left by the yard locomotive. Then the hauling engine took them and spotted them for the cement in the various cement containers, one for each batch box. In the meantime the yard locomotive went back and picked up the other 6-car section and ran that to the batcher, loaded it and brought it forward to the cement cars. The hauling locomotive, after the cement had been loaded into the first section, took the first section, took that section to the top of the hill to a switch and then returned for the second section waiting at the cement cars. The trains were similarly broken up at the paver, one section being handled by the hauling locomotive and the other by a shifting locomotive. This was necessary because the use of a full 12-car train at the paver would have interfered with the work of the finishers. 25.4.28

Rake Supplants Shovel for Puddlers

294. The time-honored method of handling the concrete on the grade after it has been deposited by the paver bucket is to shovel it. An Ohio contractor conceived the idea that his puddlers could do better work more quickly with rakes than with shovels. When he first tried it out, the puddlers stuck to the shovels but he took the shovels away and handed back the rakes. This was repeated several times but finally they were told that shovels were tabooed. Now the shovelers will not return to the use of shovels under any consideration. The rakes are not the ordinary garden variety but have long tines with short shanks. The tines reach down into the concrete, making pulling easy, and instead of picking up the particular bit of grout that happens to be on top or the very dry concrete in another section, they mix as they rake. The shanks are about 9 inches long on either side of the handle and the tines about 2 inches long. 25.4.19

Don't waste the best part of a morning getting started



OUR GOLDEN ANNIVERSARY

A half-century has passed since, in 1884, the firm of Littleford Bros. was formed to manufacture plate and sheet steel products. In 1900 the first Littleford tar kettle was made, and from that kettle has been developed the present line of Littleford Road Maintenance Equipment.

Our latest pneumatic-tired No. 84-HD Tar and Asphalt Kettle is shown above equipped with hand-spray attachment for penetration patchwork. This kettle is made in 75, 110, 165 and 210-gallon sizes.

Other Littleford kettles range in size from 10 gallons to 1500 gallons. To get complete information, write for our latest Road Equipment Catalog.

WE'VE seen pressure distributors that, on cold days, required anywhere from two hours to half a day to get the pump, valve and pipe lines thawed out and ready for operation. That's non-productive time and costs you money.

The Littleford Pressure Distributor, equipped with one low-pressure burner, heat chamber and heat deflector, can be ready for operation in half an hour. Just give us an opportunity to tell you how it heats material and gets off to a quick start on cool mornings; why it is you don't have to use an extra torch to thaw out working parts; why this distributor is so easy to operate and how its application of bitumen is accurately controlled.

Select your new distributor by comparison. Check specifications of other distributors with Littleford. Compare them point for point. That's the kind of buying we like. Why? Because you'll discover for yourself why we're so confident the Littleford Pressure Distributor has no equal! Write for our Pressure Distributor Catalog, now.

NRA WE DO OUR PART

THE SIGN OF A GOOD HEATER LB LITTLEFORD BROS. CINCINNATI, OHIO

LITTLEFORD

Road Maintenance Equipment

SINCE 1900

LITTLEFORD BROS. 485 **E. PEARL ST. CINCINNATI, O.**

During March we hope you will remember to mention CONTRACTORS AND ENGINEERS MONTHLY.

Construction Industry News

Chain Belt Co., Milwaukee, Wis., has announced that C. R. Messinger, Chairman of the Board, has resumed the post of President of the company, which was left vacant by the sudden death of his brother, Clifford F. Messinger, in December. Mr. Messinger joined the Chain Belt Co. in 1917 as Vice President and General Manager, became President in 1923 and continued in that position through 1930, when he resigned to become President of the Oliver Farm Equipment Co. and at the same time became Chairman of the Board of the Chain Belt Co. G. K. Viall, one of the Vice Presidents, has been elected to the vacancy on the Chain Belt Board created by the death of Clifford F. Messinger. Mr. Viall has been with the company since 1921, serving successively as Assistant to President, Works Manager, and Vice President.

Portland Cement Association, 33 West Grand Ave., Chicago, Ill., has announced the appointment to its staff of C. A. Clark who for the past four years has been President of Clark & Burrows, Inc., of Dallas, Texas. Mr. Clark, who was formerly associated with the Association for 13 years, returns now as Assistant Manager of the Highways and Municipal Bureau.

Patterson Foundry & Machine Co., East Liverpool, Ohio, has announced the appointment of C. V. Murray to the staff of its New York office, which is located at 30 Church Street. Mr. Murray has for 13 years been Sales Engineer for the Robinson Mfg. Co. in the New York territory.

H. J. Hush, Inc., New York City, exclusive representative for Domestic Engine & Pump Co., Shippensburg, Pa., has announced the removal of its offices from 509-515 West 56th Street, to 10 East 43rd Street, New York City, and its warehouse to Long Island City.

E. D. Etnyre & Co., Oregon, Ill., manufacturer of pressure distributors, flushers and sprinklers, has announced the appointment of Arthur C. Rerick as Special Representative. Mr. Rerick has had many years of experience in this line of business and will be glad to cooperate with those having problems which this type of equipment will solve.

Allis-Chalmers Manufacturing Co., Milwaukee, Wis., has announced the removal of its Buffalo district office to the Liberty Bank Building, Buffalo, N. Y. A. D. Brown is District Manager in charge.

Heltzel Steel Form & Iron Co., Warren, Ohio, has announced the appointment of Curtis E. Wagner, 70 E. Cuyahoga Falls Ave., Akron, Ohio., as its Foreign Sales Manager. Mr. Wagner is free to handle additional non-competitive lines for the export trade and will welcome inquiries from other manufacturers. He has two traveling representatives, one who covers Latin America and the other, the Far East.

Universal Atlas Cement Co., 208 So. La Salle St., Chicago, Ill., has announced the appointment of C. S. McArdle as Sales Manager for the Kansas City, Mo., office and Fred T. Wiggins as Sales Manager for the Birmingham, Ala., office. Mr. McArdle succeeds S. H. MacArthur, resigned, and Mr. Wiggins takes over the position formerly held by Mr. McArdle.

Kentucky Rock Asphalt Co., Marion E. Taylor Bldg., Louisville, Ky., has announced the election of Colonel Dan D. Thomson as its President, succeeding W. H. Tarvin, resigned.

The Lubrication of Prime Movers

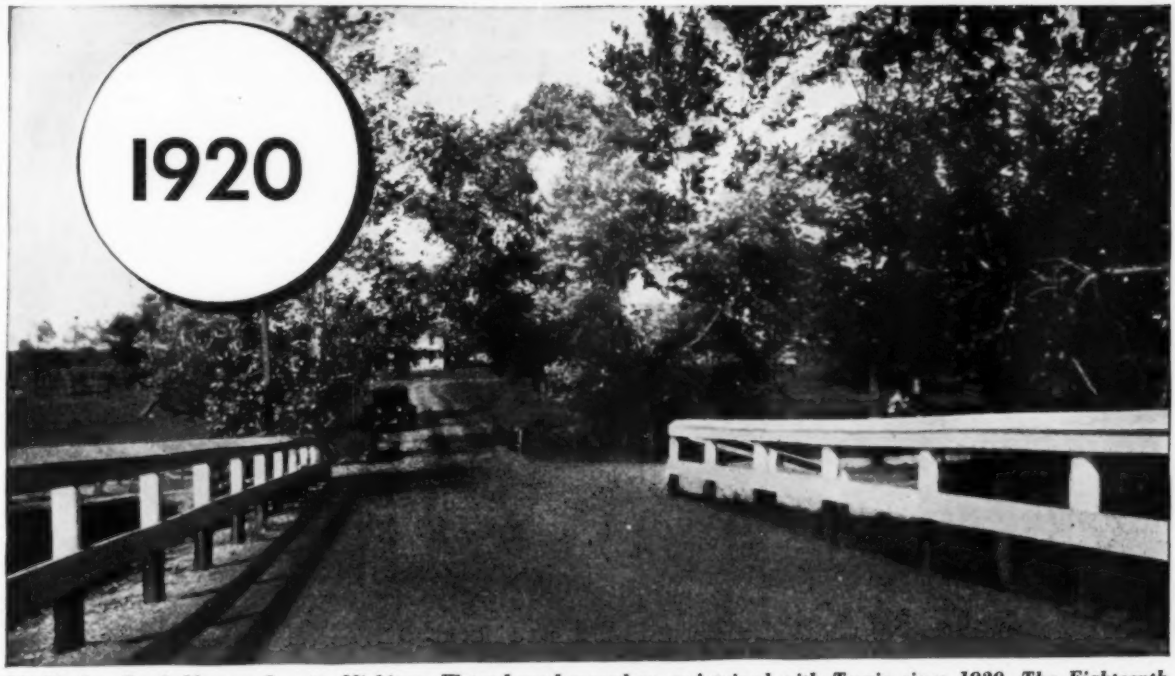
(Continued from page 32)

Motors with the plain-sleeve type of bearings require constant attention and lubrication when oil is used, as their construction does not permit retaining the oil between the bearing surfaces for any definite time. Where such bearings are employed it would be advisable to install grease cups or pressure fittings and substitute a medium-consistency grease for the oil. This would save considerable labor and prevent loss through waste. It is good practice to occasionally drain the oil from the reservoir and permit it to stand in a closed container for a few hours, permitting any dirt or sediment to settle to the bottom, when the oil can then be replaced in the reservoir. At this time, the reservoir should be thoroughly flushed to remove any sediment which may have accumulated in the bottom, preventing an early contamination of the replaced oil. After an oil has been in active use for some time, it will naturally become darker in color, due principally to metallic wear, which does not necessarily indicate deterioration of its efficiency to any marked degree. It is advisable to keep the oil in the reservoir at a normal level at all times. When bearings become abnormally warm under ordinary operating conditions, the rings should be examined to determine if they have sharp edges or badly worn grooves. This would cause the rings to jump or shake and have a tendency to overheat the bearings. When motors are exposed to low temperatures, when in operation, low cold-test oil should be used.

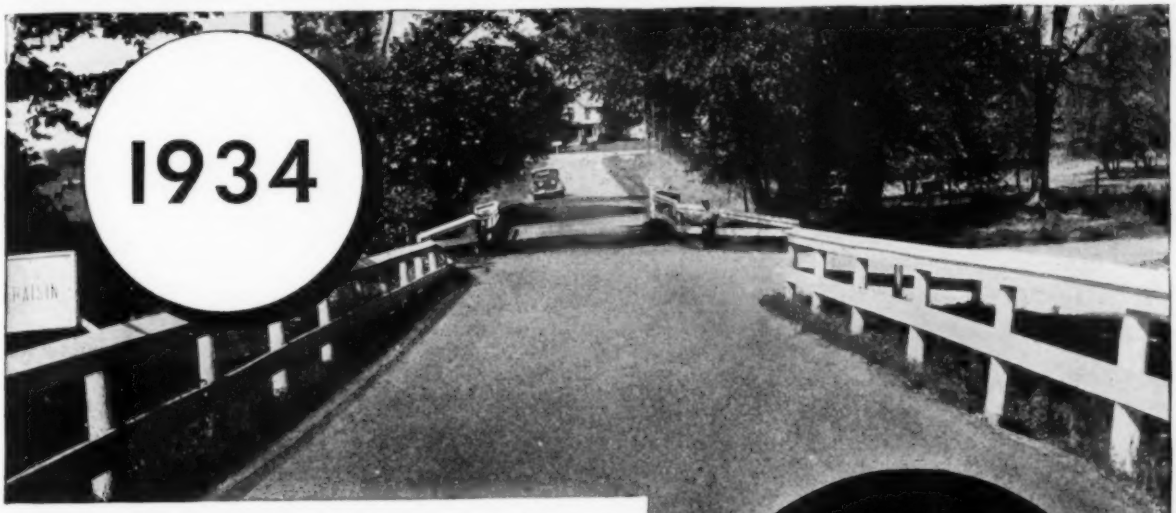
Contractors Operate Under Code Beginning March 2

PRESIDENT ROOSEVELT approved Chapter Two of the Construction Industry Code, the General Contractors' Code, on February 17. Formal organization of the General Contractors' Code Authority has been undertaken by the Executive Committee of the Associated General Contractors of America. This organization is much pleased over securing approval of their Divisional Code after eight months of intensive efforts and negotiations. Under the provisions of this chapter, twelve members of the Code Authority are selected by the Executive Committee of the Associated General Contractors of America from within its membership while five non-members likewise will be appointed.

Edward J. Harding, Managing Director of the Associated General Contractors of America, has called attention to the fact that all general contractors throughout the country are also subject to the general provisions of Chapter One, after March 2. He states, "There should be no misunderstanding as to the application of the basic chapter and the divisional and sub-divisional chapters of the Construction Code. Every employer within the construction industry will be subject to the provisions of Chapter One on and after March 2, until the chapter covering his particular division of the industry goes into effect and every employer within that division will be subject to the terms of the divisional chapter after its effective date and until a supplemental chapter covering his own particular sub-division becomes effective."



Ida-Maybee Road, Monroe County, Michigan. Water-bound macadam maintained with Tarvia since 1920. The Eighteenth Amendment went into effect that year. Upper photo was taken in 1920; lower photo shows condition of road today, proof that initial investment and maintenance need not be great to produce an efficient, long-lived road.



Tarvia is made only by The Barrett Company, America's oldest and most-experienced manufacturer of coal-tar road-building materials. It is refined to rigid specifications exactly suited to the purpose for which it is to be used. It builds durable, easy-riding, skid-safe roads that are easy and inexpensive to maintain, and it qualifies for all types of emergency highway work authorized by the Federal Government.

THE BARRETT COMPANY

New York	Chicago	Philadelphia	Cleveland	Boston
St. Louis	Minneapolis	Lebanon	Toledo	Birmingham
Detroit	Baltimore	Columbus	Youngstown	Milwaukee
Buffalo	Providence	Syracuse	Hartford	Cincinnati
	Bethlehem	Rochester	Portland, Me.	

THE BARRETT COMPANY, LTD.

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Barrett Tarvia GOOD ROADS AT LOW COST

The Vibrator Attached to a Beam

Vibrating Steel Reinforcing Gives Stronger Concrete

A VIBRATOR designed to facilitate handling and to improve the operating characteristics of the machine to give definite vibration to reinforcing and structural steel to be encased in concrete, has been developed by the International Steel Tie Co., 16702 Waterloo Road, Cleveland, Ohio. This machine consists of a vibrating head and motor mounted with spring suspension, in which both the motor and the vibrating unit are carried by a frame which incorporates clamps for attaching the machine directly to the structural member, without the use of any auxiliary supporting device.

The vibration is produced by an eccentric weight rotated at high speed about an axis parallel with the structural member to which the machine is clamped. The eccentric disk is made adjustable to permit varying of the off-center weight to obtain a degree of vibration proportionate to the size and weight of the member vibrated. Three points of attachment to the beam are provided to prevent skewing of the machine while in operation. The vibrator is attached to one side of the beam by two adjustable jaws, and the final locking in fixed position is accomplished by a screw clamp on the other side of the beam. The two clamps can be adjusted by ¼-inch increments to fit beam widths from 6 inches to 18 inches. Two men can pick up and move the machine by a long pole handle on top.

Tests with a 1:2:4 concrete mixed with water in the proportion of 6 gallons per sack of cement provided a concrete which was too dry for hand tamping and specimens were porous and not good concrete. Under vibration, however, the mix worked very well and gave a strength in bond averaging 6,750 pounds or 496 pounds per square inch.

Batteries for All Kinds of Trucks

FOLLOWING its introduction of the new "Electro-Pak" automobile storage battery for passenger cars, the B. F. Goodrich Co., Akron, Ohio, has announced an extension of its line to include batteries made for practically every size truck, bus, fire truck, taxi-cab and tractor. Plates in the new batteries are of special bus and truck design, heavier than those used for passenger car batteries. Separators are of the highest grade vertical grain Port Orford cedar, whose insulating strength is increased by perforated rubber sheets. This tends to retain the active material in the positive plates, and prolong battery life.

Connectors are large, flexible lead-covered copper strips, which will carry the high discharge necessary in truck and bus operation, and because of flexibility do not break because of severe vibration to which the battery is subjected. Genuine hard rubber cases are used unless wood is desired. Bus and truck T & H types carry a guarantee and adjustment policy for eight months or 24,000 miles, passenger car Super types in truck service twelve months or 24,000 miles and passenger car standard and heavy-duty types in truck service nine months or 18,000 miles.

An Improved Road Material Spreader

THE Koch improved, revolving disc spreader for sand, gravel, cinders, chips or calcium chloride, which is hinged to the truck by means of just one long tapered bolt, has recently been announced by the Kob Manufacturing Co., 4929 No. Woodburn St., Milwaukee, Wis. This spreader is designed low enough to attach to any of the smaller trucks, provided they are equipped with a conventional-type body and hoist, and without any change it will perform equally well behind the largest capacity trucks.

Standard equipment includes the draw bars which support the hinge bolt and are attached permanently to the truck frame, a slide door for the center of the truck tail-gate and the grooves to slide in, a control lever for the slide door, and a spout. The material is controlled at the tail-gate as it slides from the truck, in addition to the adjustment provided for the control of the quantity of material flowing from the spreader hopper through the revolving disc. With this double control, the material to be spread can be moist or dry, coarse or fine, or both coarse and fine mixed, and still spread a very light application if desired. The width of the spread is controlled by the disc speed and depends directly on the speed of the truck. Spreading speeds vary between 4 and 11 miles per hour, depending on the results desired. To confine the spread to a very definite portion of the road width, side guards or wings are provided to hook on to either one or both sides of the spreader. These guards are adjustable to varying widths.

The operation of this spreader is very simple. With the truck dump body down, resting on the frame, the spreader rides suspended, with the spreader wheels raised well off the ground, carried by the hinge bolt at the front and supported at the rear by two chains extending from each rear corner of the spreader to the top corners of the truck tail-gate. When the truck body is raised, these chains slack and the spreader, still hinged to the long pulling bolt at the front, rests with its wheels on the ground. Any motion of the truck, either forward or backward, will turn the spreader wheels, rotating the spreader disc by the power applied from the spreader wheels through a solid axle and bevel gear drive. All moving parts are well protected from dirt and grit and the most durable material is used throughout.

A P & H Model 202-B Multiple-Purpose Shovel Mounted on a Linn Truck Chassis in Use on a Road Widening Project

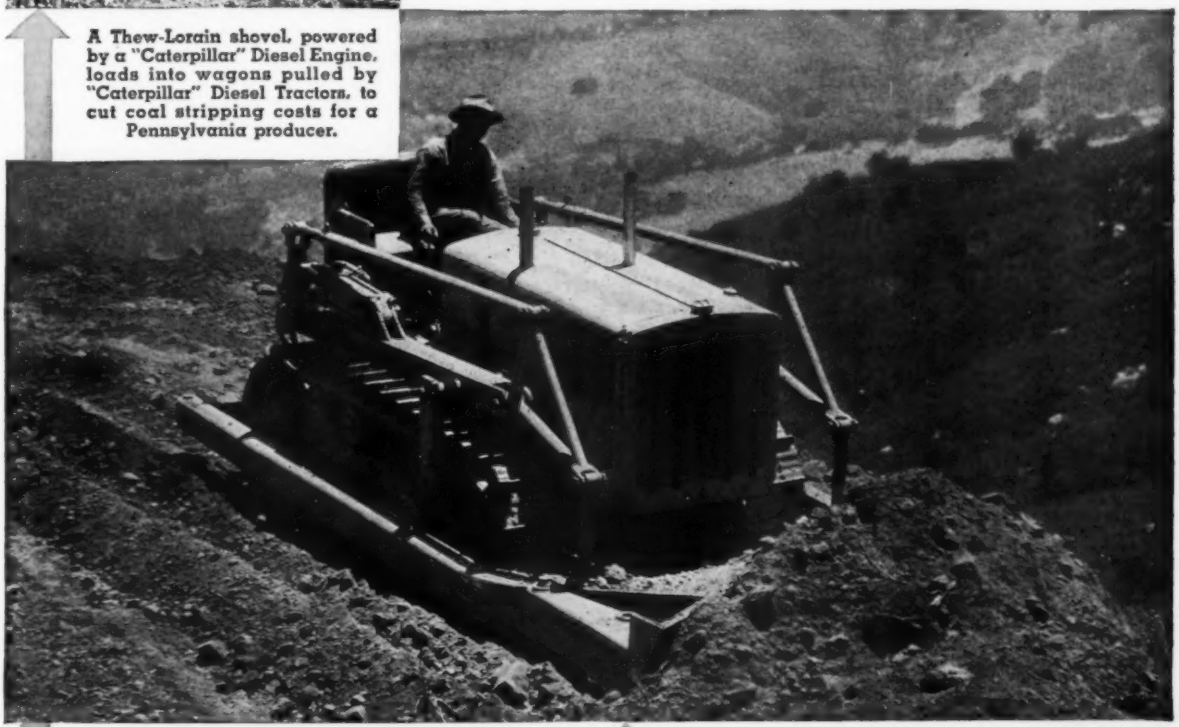
"WITH TWO 'CATERPILLAR' DIESELS OUR FUEL SAVING IS $748.80 PER MONTH"

● ● *says Clarence Crow of Crow Brothers, Southern California contractors, working* **16** *hours per day,* **26** *days per month, saving* **90c** *per hour on fuel with each tractor.*

Fuel economy — the economy of using low-price fuel and less of it — brings worth-while savings on every job, big or small. That's why "Caterpillar" Diesel Tractors are sweeping into favor with tractor users everywhere. That's why "Caterpillar" Diesel Engines are being employed by so many stationary power users, and have been adopted by builders of shovels, drag lines, gravel plants, locomotives and other equipment, to power their machines. Fuel economy — plus easy operation, simplicity, stamina. Ask for full information. Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

AMERICA GOES DIESEL

A Thew-Lorain shovel, powered by a "Caterpillar" Diesel Engine, loads into wagons pulled by "Caterpillar" Diesel Tractors, to cut coal stripping costs for a Pennsylvania producer.



"Casting-in" with a "Caterpillar" Elevating Grader on road work, this "Caterpillar" Diesel Seventy-Five Tractor moves 4000 yards per day at a fuel cost of $2.48.

Pushing a "trailbuilder" blade, this "Caterpillar" Diesel Tractor makes a new mountain road at a fuel-cost about one-quarter that of a gasoline tractor.

An Installation of Tuthill Highway Guard Rail

A Guard Rail That Protects Motor Vehicles

MORE and more state highway departments as well as cities are installing metal guard rails to prevent cars leaving the right-of-way on steep shoulder grades, sharp curves, bridge approaches and similar spots where careless drivers or cars out of control may cause considerable damage to occupants as well as property. The same highway departments are permitting contractors to choose the type of guard rail from approved lists. Hence, contractors must be conversant with types which will be entirely satisfactory when installed.

The Tuthill highway guard, made by the Tuthill Spring Co., 760 Polk St., Chicago, Ill., is an all-metal resilient steel rail which allows a vehicle to hit it and still continue on the highway with a minimum of damage. When the automobile strikes the Tuthill guard, the bumper action of the spring rail support carries the force of the vehicle impact to the base of the post with the resultant action of absorbing the impact at the ground and not breaking the post. The guard rail itself, firmly attached to the spring with clips and button-head machine bolts, is convex on the side toward traffic, presenting a smooth surface to any vehicle striking it. The design of the rail is such that the ends overlap in the direction of traffic, and they are slotted ⅝ x 1⅛ inch at one end with round holes at the other end. The underneath part of the overlapped joint is the slotted end. This permits expansion and contraction and also aids in erection.

A 25-Yard Air-Wheel Buggy

THE new Le Tourneau 25-yard buggy, recently announced by R. G. Le Tourneau, Inc., Wilson Way at Roosevelt, Stockton, Calif., embodies a new feature based on the principle that less power is necessary to push a load out of a body horizontally than to raise or tip the load and body. This buggy is a bottomless body, sliding over a fixed bed which forms the bottom of the container, and with its supporting and bracing members forms the structure for the wheel trucks.

The loading position of the body is directly over the bed and discharge is effected by pushing the dirt bodily from the bed by the rearward movement of the body, leaving an ever-widening opening until the front wall of the body is over the apron forming the back of the bed. The buggy can be unloaded while in motion or can be backed up for an end dump. The standard Le Tourneau double-drum power control unit furnishes power for the unloading of the body and its return to loading position.

This buggy, which is made of special alloy steels throughout with heat-treated axles and wearing parts, has a body width of 10 feet, an average body length of 12 feet, a depth of 4 feet, an overall height of 8 feet 3 inches, an overall length of 23 feet, a heaped capacity, of loose material, of 25 yards, and eight 20-inch air-wheel tires 46 inches in diameter on a 10-inch hub.

A New Two-Bag Concrete Mixer

THE Koehring 10-S Dandie mixer, recently announced by the Koehring Co., Milwaukee, Wis., is sturdily built, yet exceptionally light in weight, combined with speed in operation. This new unit, which is powered with a multiple V-belt drive Le Roi 10-hp engine, has a number of features, including the spring-mounted frame anti-friction bearings, automotive-type steering, accurate syphon-type water tank, and fast and clean charge and discharge.

A free-rolling drum is supported on beveled-edge 10-inch rollers, solidly fastened to shafts turning in self-aligning, double-row ball bearings. All operations are controlled by the operator, as the one-man end control permits him to see both sides of the mixer. Charging, mixing and discharging are handled from the drum end of the machine. After the skip clutch is engaged, the operation becomes automatic, as the skip is held in position after it reaches the discharging height. The chute is self-locking in both positions. A large roomy welded skip, wide at the back, without obstructing rivet heads or corners, permits easy loading and speedy drum discharge. A skip shaker automatically prevents materials sticking in the skip. A large wide pivoted discharge chute of high carbon steel, extending far into the drum, insures a complete discharge.

The frame is mounted on the axles by means of two springs at the rear and one spring at the front. The full-floating spring mounting of the frame, when combined with steel or rubber tread roller bearing wheels, provides portability. The frame is sturdy and electrically-welded throughout, with torsion resisting members, to form a solid and rigid unit. When the mixer is in operation, it is held rigid by easily adjustable stabilizers. The multiple V-belt drive is designed to insure continuous operation. It is troubleproof, silent, smooth-running and is not affected by dust, dirt or water. The belts are slip-less, as the power is transmitted by a wedging contact.

The vertical syphon-type water measuring tank, especially designed for accurate and fast water supply, is simple in construction and dependable in operation. The principle is the same as used on Koehring pavers. Any amount, to a fraction of a pint, from 4 to 18 gallons can be discharged as desired. The dial indicator permits setting in pounds or U. S. Gallons. The flow of water at any pressure is positively controlled by a 2-inch balance valve. The water tank is also self-cleaning.

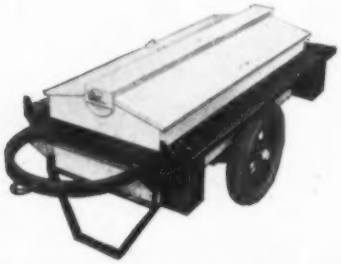
The New Koehring 10-S Dandie Mixer

A Portable Steel Tool Box to Protect Hand Tools

A STEEL tool box mounted on wheels, and which is weatherproof, fireproof and thiefproof, is a valuable part of the equipment of any contractor using a large number of hand tools. The HanDeeBox made by Littleford Bros., 485 E. Pearl St., Cincinnati, Ohio, has double covers which are fastened by one lock built into the box and without a padlock. When in locked position, the covers flange over the sides of the box and are held in that position by special keepers locked the full length of the box. The keepers must be shifted to release the covers, very much the same arrangement as is used on a safe.

In addition to the locking arrangement, both the front and rear drop legs are fastened in position from inside the box and they cannot be released except by raising the tool box cover. The wheels and tires can be locked to the box so that it cannot be trailed except by those having a key to the box. When the HanDeeBox is locked up and left standing at the side of the road or in a field, the only way to get it open without a key is to use a cutting torch.

There is a large compartment for picks, tampers, shovels, jack hammers, etc.; a sliding shelf divided for small equipment, first aid kit and records; lantern guards, semi-elliptical springs. Timken roller bearings, and pneumatic or solid rubber tires finish off the equipment.



The Littleford Trailer-Mounted Steel Tool Box

Keeping Soft Stone Out of Concrete Aggregate

THE constant tightening of specifications for concrete aggregate, especially for road and bridge work, has led many material producers and manufacturers of gravel plant equipment to seek new methods for eliminating soft stone from bank run material. The new Knickerbocker Soft Stone Eliminator, designed and built for this purpose by the Knickerbocker Co., Jackson, Mich., consists of a rotor revolving in a vertical plane within a suitable casing. The rotor is supported by a heavy shaft revolving in two roller-bearing pillow blocks. The impact bars of the rotor are of high-alloy, specially heat treated steel.

In operation, the Eliminator is introduced into the line of production after the sand has been removed from bank-run material. The stone is fed into the machine through a 15-inch opening on the charging side, goes through the unit and is discharged at the bottom, generally onto a sizing screen. While inside the machine, the stones are struck repeated blows of constant intensity by the impact bars, are carried up around the inside of the casing and are subjected to constant abrasion upon each other before being discharged. An inlet provides for the introduction of water and the pulverized soft stone runs off at the bottom in the form of a thick sludge. A 20-horsepower motor runs the outfit which has a capacity of from 50 to 90 tons per hour.

New Nested Flares for Warning Signals

Bolser Nested Flares

BOLSER heavy-duty flares, designed and built for contractors' use for guarding highway construction, paving, pipe line work and similar jobs where the safety of the traveling public is involved, are manufactured by the Bolser Corp., SW 9th St., Des Moines, Iowa. These flares are built of especially heavy 19-gage steel, entirely welded, with a burning capacity of 26 hours. The flare lights instantly and has a special burner construction, with a wind screen, making lighting easy under any conditions. The burner automatically generates gas, having oil and wicks.

These flares meet all requirements of state laws and are both wind and water-proof. They are so designed that three or four flares may be nested, safely locked into one unit which is easily handled by means of an automatic locking handle which is furnished free with each four flares. They are round in shape, with flat top and bottom, and have a capacity of approximately 4½ pints of kerosene, which is the fuel required. These flares are also made in compact units for use on trucks to fulfill state regulations.

A New Scale for Accurate Asphalt Mixes

AN accurate asphalt mix scale which is adaptable to installation on an overhead track for either stationary or portable plants, is manufactured by the Exact Weight Scale Co., Columbus, Ohio. The scale is structurally simple and weighs accurately in out-of-level positions as well as when set up level. There is no complicated mechanism to get out of adjustment; the problem of service is small, and untrained labor quickly learns its operation.

The dial of this scale makes the weight easily visible, and the indicator does not move on the dial until the load is within 25 pounds of the desired weight. That interval of warning to the operator is ample for his closing the valve at the precise moment to prevent dribble loss. On the weight control sector of the dial the recommended division for asphalt is 25 pounds underweight and 5 pounds overweight. The reading beam has a capacity of 15 pounds by 1-pound divisions to provide for units between 1 and 15 pounds and is equipped with a sliding poise. The weight rack is placed on the back of the scale; but if head clearance permits a vertical rack, it may be placed on top of the housing at any convenient angle. In a vertical position, its height with weights is 6 inches.

The Transportation of the Heaviest Construction Equipment Is Handled Safely and Economically with a Heavy-Duty Fruehauf Trailer. The Photo Shows the Moving of a Large Bucyrus-Erie Crane Over a Concrete Highway.

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